5-2-2005

Combined BS/MS in Environmental Science & Ecology

The College at Brockport, College Senate

SUNY BROCKPORT

College Senate
State University of New York
College at Brockport
350 New Campus Drive
Brockport, NY 14420-2925
(585) 395-2586 (Fax) 395-2246

Resolution # 27
2004-2005
COLLEGE SENATE

COLLEGE SENATE
SUNY College at Brockport
MAY 26 2005
350 New Campus Drive
Brockport, NY 14420-2925

TO: Dr. John B. Clark, Interim College President

FROM: The Faculty Senate Meeting on: ***May 2, 2005***

RE: ⇨ I. Formal Resolution *(Act of Determination)*
II. Recommendation *(Urging the Fitness of)*
III. Other, For Your Information *(Notice, Request, Report, etc.)*

SUBJ: ***Combined BS/MS Program in Environmental Science and Biology***
(#86 03-04 GC/UC)

Signed: Dawn M Jones Date: May 6, 2005
(Dr. Dawn M. Jones, 2004-2005 College Senate President)

Please fill out the bottom portion and return document to the College Senate Office.

TO: The College Senate

FROM: Dr. John B. Clark, Interim College President

RE: ⇨ I. Decision and Action Taken on Formal Resolution **(circle choice)**
a. Accepted. Effective Date: 5/23/05
b. Deferred for discussion with the College Senate on ___/___/___
c. Unacceptable for the reasons contained in the attached explanation

II, III. Response to Recommendation or Other/FYI
a. Received and acknowledged ___/___/___
b. Comment: _____

DISTRIBUTED BY PRESIDENT'S OFFICE TO: Executive Council
DISTRIBUTED BY PROVOST'S OFFICE TO: Dean's Council
DISTRIBUTED ALSO TO: Originator, Academic Advisement, Registrar (as appropriate)

Signed: John B. Clark Date: 5/23/05
(Dr. John B. Clark, Interim College President, SUNY College at Brockport)

FACULTY SENATE OFFICE
RESOLUTION PROPOSAL COVER PAGE

ROUTING NUMBER*	#56 03-04 GC/UC

NUMBER TO BE ASSIGNED BY SENATE OFFICE

DEADLINE FOR SUBMISSIONS: MARCH 1 - Proposals received after March 1 may not be reviewed until next semester.
Submit all proposals to the Faculty Senate President electronically or on a disk with a hard copy.
Please provide cover page information requested.
facprez@brockport.edu, senate@brockport.edu
Faculty Senate Office, 426 Allen Building

1. PROPOSAL TITLE:

Please be somewhat descriptive, for example, *Graduate Probation/Dismissal Proposal* rather than *Graduate Proposal*.

Combined BS/MS Program in Environmental Science and Biology –

2. BRIEF DESCRIPTION OF PROPOSAL:

This is a proposal for a combined BS/MS degree in Environmental Science and Biology

3. SUBMISSION & REVISION DATES: PLEASE DATE ALL UPDATED DOCUMENTS and resubmit to the Senate Office electronically prior to Senate review and vote at fsenate@brockport.edu.

First Submission	Updated on	Updated on	Updated on
27 February 2004	**April 4, 2005**	**April 11, 2005**	

4. SUBMITTED BY: (contact person)

Name	*Department*	*Phone*	*Email*
Joseph Makarewicz	Environmental Science and Biology	395-5747	jmakarew@brockport.edu

5. COMMITTEES TO COPY: (Senate office use only)

Committee	*Forwarded To*	***Date***
__ Budget	Committee Chair	***3/3/04, 4/4/04***
__ College Environment	Executive Committee	***4/11/05***
__ Enrollment Policies	Senate Floor	***4/18/05***
__ General Education	College President	***5/6/05***
_X Graduate Curriculum		
__ Personnel Policies		
__ Student Policies		
_X Undergraduate Curriculum		

Department of Environmental Science and Biology, SUNY Brockport

Proposal for

a. Combined BS/MS in Environmental Science and Biology

Programs to be combined – BS in Environmental Science HEGIS 0420 (SED 23535) and MS in Environmental Science and Biology HEGIS 0420

The Vision

The proposed combined BS/MS Program in Environmental Science and Biology would attract and improve retention of high parameter undergraduate students majoring in the Department of Environmental Science and Biology by offering them an efficient, time-shortened degree program and a rich portfolio of courses. The goal of the proposed combined BS/MS in Environmental Science and Biology is to develop in its students an advanced understanding of ecosystem structure and function, and how environmental stressors affect them. Graduates of SUNY Brockport's combined BS/MS in Environmental Science and Biology will be trained in a variety of modern scientific methods in environmental chemistry and toxicology, ecological genetics, statistical and computational analysis, and field biology. The interdisciplinary nature of our program will facilitate interaction among students and faculty with different areas of expertise, both within SUNY Brockport and across a broad range of academic, governmental and non-governmental institutions. Our program will encourage students to design and conduct innovative graduate research projects, and to develop strong written and oral communication skills through presentations at professional meetings and submission of manuscripts to peer-reviewed journals.

Graduates of the combined BS/MS Program in Environmental Science and Biology will be "well rounded specialists" in Environmental Science. They will have solid science backgrounds with an undergraduate specialty in either Environmental Chemistry, Earth Science, Aquatic Ecology or Terrestrial Ecology. Courses included in this curriculum will ensure high levels of oral and written communication skills and technical expertise, will help students acquire up-to-date knowledge on environmental issues and politics and develop the strong scientific and analytical skills essential for solving tomorrows vexing environmental problems.

The proposed combined BS/MS program in Environmental Science and Biology will provide a solid background in the natural sciences. Students participating in the graduate potion of the program will take a minimum of 30 credit hours by faculty advisement. Graduate courses could be taken in at least two of the college's Schools – Letters and Sciences and Professions. For example, Environmental Law is offered in the School of Professions. However, we expect that most course offerings would be from the School of Letters and Sciences. The program contains courses that integrate the expertise of faculty in several departments, such as Biological Sciences, Chemistry and Earth Sciences. Thus, the course sequence selected by the student, in collaboration with the Thesis Advisory Committee, may include courses from other disciplines and draw on environmental experts from the larger community. This unique approach reflects the interdisciplinary nature of the program.

Graduate students are also important to our ability to attract research funds and develop the quality of the undergraduate program in Environmental Science and Biology. Graduate students

are an integral part of the vigorous research programs directed by faculty in the Department of Environmental Science and Biology. Since 1995, our graduate students in the MS program in Biological Sciences with interests in ecology and environmental science have produced 32 theses based on original research (Appendix A). Since 1995 research by Drs. Haynes, Norment and Makarewicz have generated approximately $4.8 million in external funding, much of which has gone to support graduate student research. During the same period externally-funded research by faculty with expertise in environmental science and biology has resulted in at least 30 peer-reviewed publications, including 15 with graduate student coauthors. Ongoing research by Department of Environmental Science and Biology faculty in areas such as toxic chemical levels in Great Lakes biota, water quality problems in the Finger Lakes and Lake Ontario, phytoplankton and zooplankton dynamics in the Great Lakes, fisheries ecology in Lake Ontario and the Finger Lakes, stressed stream analyses of watersheds, impacts of zebra mussels, spiny and fishhook water fleas and other exotic species on Lake Ontario, wildlife use of wetlands; migration ecology of songbirds; and the breeding biology and habitat selection of grassland birds has brought SUNY Brockport a regional and, in some areas, national and international reputation for ecological research.

Evidence of Need

It is difficult to talk in general terms about "Environmental" employment. Whereas industries like biotechnology, auto manufacturing, and software design have a clear set of specific employers with relatively similar job titles and descriptions, the environmental job market is dispersed over thousands of public, private and nonprofit employers. Some of these employers are identifiable as "environmental," while other employers include environmental functions within an apparently unrelated business. Thus an important aspect of environmental employment is the fact that jobs are widely dispersed across thousands of small units, rather than being largely centralized in relatively few, well-known places.

The *"Environmental Trends Report: 2002"* of the Environmental Careers Organization (ECO) identified the following important, emerging multidisciplinary eco-careers:

1. Pollution prevention/Waste reduction specialist
2. Conservation biologist/ecosystems manager
3. Environmental information technology/GIS
4. Environmental manager
5. Global climate researcher
6. Renewable energy and energy management
7. "Smart Growth" urban planner
8. Policy integration specialist
9. Community organizer
10. Fundraiser
11. Environmental economist
12. Environmental health specialist

In 2000, 64,000 jobs were identified as available under the category of Environmental Scientist by the ECO (Environmental Career Trends: 2002). By 2010, ECO projects a 14,000 increase in the number of Environmental Scientists - a 22.3% increase in jobs (Table 1). Other occupations, such as Conservation Scientist, Forest Conservation Scientist, Geoscientist, Hydrologist and Environmental Technician, for which students with an MS in Environmental Science would qualify, show an increase of another 18,000 positions by 2010. Thus, a minimum increase of 32,000 jobs related to Environmental Science are projected by 2010.

Projected national job trends indicate that a national and local need exists for trained scientists with a M.S. in Environmental Science and Biology. The *Occupational Outlook Handbook*, published by the U. S. Department of Labor, forecasts that employment of environmental scientists is "expected to grow faster than the average for all occupations through 2010", due to the "continuing need for companies and organizations to comply with environmental laws and regulations". The projected increase in jobs for environmental scientists through 2010 is expected to be between 21 to 35 percent. The *Occupational Outlook Handbook* also predicts a growth of jobs as conservation scientists, another occupation that many graduates of a M.S. program in Environmental Science and Biology would be qualified of between 3 to 9 percent. Kevin Doyle, Director of Career Education for the Environmental Careers Organization, also predicts that the need for Environmental Scientists will increase by over 20% in the coming decade with the need for conservation scientists increasing by over 8% (Table 1). At the regional level, continuing concern about environmental issues in the Great Lakes Basin, protection of air and water quality, conservation of wetlands and the environmental needs of companies such as Xerox and Kodak should ensure a steady demand for environmental scientist professionals with graduate degrees. For example, a 1998 survey by the Environmental Careers Organization of 40 employers in the private sector and government agencies asked, "When hiring non-seasonal, entry level environmental professionals, what level of education/training do you prefer?" Forty percent responded that the undergraduate degree was preferred followed closely (29%) by the Master's degree[1].

Locally, the consistently high number of graduate students supervised by Drs. Haynes, Norment and Makarewicz in their former department, the Department of Biological Sciences, provides an indication of current and future demand for a M.S. program in Environmental Science and Biology at SUNY Brockport (Appendix A). Perhaps of greater importance in illustrating the existence of a local and national job market in environmental science is the placement record of our M.S. students (Appendix A). Some have gone on to Ph.D. programs at major research universities, but the majority has entered the job market. Our former M.S. students are working for the U.S. Environmental Protection Agency, New York Sea Grant, U.S. Fish and Wildlife Service, New York State Department of Environmental Conservation, Monroe County Health Department, Orleans County Soil and Water, Monroe County Pure Waters, Ecology and Environment, Inc., Battelle Laboratories, Mote Marine Laboratory and Paul Smith's College, to name but a few.

[1] The Environmental Careers Organization (ECO) has been serving the needs of environmental employers, students and aspiring professionals for 25 years. ECO, 179 South Street, Fifth Floor, Boston MA 02210

Table 1. Projected employment by occupation in fields related to Environmental Science. Data from The Environmental Careers Organization[1].

Occupation	Employment (in 1000s)		Change	
	2000	2010	Number	Percentage
Environmental Scientists	64	78	14	22.3
Conservation Biologists	16	18	2	8.3
Forest Conservationist	20	22	1	3.9
Geoscientists	25	30	5	18.1
Hydrologist	8	10	2	25.7
Env. Protection Techs	27	34	7	24.5

TOTAL ENVIRONMENTAL	160	192	32	20.0
Economists	22	26	4	18.5
Chemists	84	100	16	19.1
Biological Scientists	73	88	15	21.0
Other Life Scientists	28	33	4	15.9

Faculty

The proposed graduate program will be delivered by innovative faculty, all of whom hold a PhD and who have extensive research experience, professional achievements, and a record of collaboration with other researchers in academia, industry and government (Appendix D). Environmental Science faculty are members of the Department of Environmental Science and Biology and have directed over 57 M.S. degrees in their former department, Biological Sciences (Appendix A). This faculty has attracted over $4.8 million in external funds from NOAA, EPA, Sea Grant, Army Corps of Engineers, Biological Research Institute, U.S. Fish and Wildlife Service, and the New York State Department of Environmental Conservation, and they have published in peer-reviewed journals such as Science, Bioscience, Ecological Monographs, Journal of Great Lakes Research, Environmental Science and Technology, Auk, Condor and Canadian Journal of Zoology. The vigorous, externally-funded research programs of the faculty has meant that funding of graduate stipends and research supplies often has been augmented by external funding sources.

We envision the graduate program as reflecting the interdisciplinary approach of the undergraduate major in Environmental Science and Biology. Thus, graduate faculty with supervisory privileges will also include "Associate Faculty" (Appendix D) from departments other than Environmental Science and Biology who teach courses in the undergraduate B.S. program in Environmental Science or who, by petition to the Chairperson of the Department of Environmental Science and Biology, request to be "Associate Faculty". Currently, "Associate Faculty" reside in the Departments of Earth Sciences, Psychology, and Chemistry (e.g. See Appendix D). Appointment of additional Associate Faculty from other departments is possible in the future. Associate Faculty in the Departments of Chemistry, Earth Sciences and Psychology with expertise in areas such as geographic information systems, wetland systems, animal behavior, green chemistry, surficial geomorphology, and environmental chemistry will be able to supervise graduate students.

[1] The Environmental Careers Organization (ECO) has been serving the needs of environmental employers, students and aspiring professionals for 25 years. ECO, 179 South Street, Fifth Floor, Boston MA 02210

With the combined expertise of faculty from the Department of Environmental Science and Biology and Associate Faculty from other departments, the graduate teaching and research program in Environmental Science and Biology at SUNY Brockport would become even stronger with opportunities for students to pursue advanced study in a much wider range of subjects.

Library Resources*: Journals available to graduate students through Drake Memorial Library are listed in Appendix E.*

Resources: No new fiscal or faculty resources are required for this proposal.

Computer Facilities: Lennon Hall houses a satellite "PC Center" with 24 Gateway PCs and a SUN equipped center (10 machines) for computer modeling.

Laboratory and Field Facilities:
There is a wide range of well-equipped laboratories and field research equipment available for environmental research at SUNY Brockport. The Lennon Hall facility, where the Department of Environmental Science and Biology and the Department of Earth Sciences are housed, was recently renovated with funds from the National Science Foundation and the New York State Construction Fund. The ~$13 million renovation provides state-of-the-art facilities, with new equipment ranging from radio-telemetry gear for tracking birds and fish, a Geographic Information Systems lab, a new $38,000 fish-electroshocking vessel; a 25-foot lake-going vessel for Lake Ontario equipped with GPS, marine radio, fathometer, SeaBird CTD, gas powered winch; three Bran-Luebbe chemical autoanalysers, Perkin Elmer atomic absorption (flame and graphite) spectrophotometer, HP G1800C Quadrapole GC/MS, Agilent 6890N Network Gas Chromatograph System, and assorted spectrophotometers, fluorometers and microscopes. Additional facilities under departmental direction include an aquaculture facility, aquaculture ponds, diluter room for toxicity testing, a greenhouse, a NELAC (National Environmental Laboratory Accreditation Consortium) certified analytical laboratory, herbarium, and a large walk-in environmental chamber. Nearby field sites used on a regular basis for teaching and research include Iroquois National Wildlife Refuge and Braddock Bay Bird Observatory.

The Combined Bachelor of Science and Master of Science Program

General: Students pursuing the BS/MS degree would be required to complete a minimum of 138 semester hours. Of these 138 credits, 30 credits would be at the graduate level and 108 credits would be at the undergraduate level (see Requirements for the BS/MS in Environmental Science for details). At the graduate level, thirteen hours of core courses that include a defended thesis based upon original research would be required. Students would also have to pass an oral comprehensive exam administered by their "Thesis Advisory Committee". Students pursuing a BS/MS in Environmental Science and Biology would be supervised by faculty members in the Department of Environmental Science and Biology, and by qualified "Associate Faculty" from the Departments of Earth Science, Psychology and Chemistry, which currently collaborate with the Department of Environmental Science and Biology on the B.S. program in Environmental Science.

Admission: Students must apply for admission to the combined degree by the middle of the second semester of their junior year. Admission to the combined program is selective, restricted to students with exceptional records and to availability of a faculty member to serve as a thesis advisor. Students must have a cumulative GPA of 3.4 or better through the end of the junior year to be accepted into the program. Transfer students could be considered for the BS/MS program after taking 30 credits of course work at SUNY Brockport. Qualified applicants will be interviewed by the Department of Environmental Science and Biology as a whole, which will make the final decision on admissions. Achievement of the minimum standards for admission does not guarantee acceptance. Since the Combined Program will be limited to 10 students per year, the academic burden on faculty should be manageable.

Major Advisor and Thesis Advisory Committee: **Upon admission to the BS/MS program in Environmental Science and Biology, the candidate will be assigned a Major Advisor by the Department of Environmental Science and Biology. This decision will consider the student's area of specialization and the willingness of the faculty member to accept the responsibility of serving as the Major Advisor. The Major Advisor will monitor the student's academic progress and be responsible for direction of the Thesis Proposal, Oral Comprehensive Exam and the Thesis Defense.**

The candidate, with the advice of the Major Advisor, will select two other members who, together with the Major Advisor, will constitute the candidate's Thesis Advisory Committee. One member may be a scientist not from the Brockport campus. The Thesis Advisory Committee will:

1. **With the candidate develop a Plan of Graduate Study (see below);**
2. **Act in an advisory capacity concerning thesis research;**
3. **Administer and evaluate the candidate's Oral Comprehensive Exam;**
4. **Evaluate the candidate's written thesis (ENV 704);**
5. **Administer and evaluate the Thesis Defense; and,**
6. **Terminate the student's participation in the graduate program if the student does not make reasonable progress towards completion of the M.S. degree, or does not maintain a 3.0 GPA. Reasonable progress is defined by the following:**
    a. **The maintenance of a GPA of 3.0 in courses listed in the Plan of Graduate Study; and**
    b. **The development of a Thesis Proposal and Plan of Graduate Study in a timely manner**.

Graduate Dismissal Policy: **Students in the Combined BS/MS with a GPA below 3.0 in courses listed on the Plan of Graduate Study will have one semester to bring the GPA to 3.0. Failure to bring the GPA to 3.0 will result in the student's dismissal from the program. Students with a GPA below 3.0 may not enroll in Thesis (ENV 704).**

Duration and Time Limit: **Table 2 shows a five-year, full-time course of study for completion of the Combined Program. The first three years are spent taking undergraduate courses, while in the 4th year (>90 undergraduate credits), students may take four (up to 12 credits) graduate courses, with a fifth year for the remaining graduate courses and research. Due to the vagaries of experimental and field-related research, completion of a defended thesis may not occur by**

Table 2. A suggested five-year course schedule for a BS/MS student in Environmental Science and Biology.

Freshmen -Fall	Cr	**Freshmen- Spring**	Cr
Environmental Science	4	Principles of Biology	4
College Chemistry I	4	College Chemistry II	4
General Education Courses	6	General Education Courses	6
Academic Planning Session	1	Elective	1
SubTotal	15	SubTotal	15
Sophormore -Fall		**Sophomore – Spring**	
Ecology	4	Intro Meteorology	4
Organic Chemistry	4	Analytical Chemistry	4
General Education/College Electives	4	General Education/College Electives	4
Environmental Law	3	Statistics or Calculus I	3
SubTotal	15	SubTotal	15
Junior- Fall		**Junior –Spring**	
Physical Geology	4	General Education/College Electives	6
General Education/College Electives	11	Track Electives	9

SubTotal	15	SubTotal	15
4th Year - Fall		**4th Year – Spring**	
Undergraduate Electives (college or track)	9	Undergraduate Electives (college or track)	9
Graduate Courses	6	Graduate Courses	6
SubTotal	15	SubTotal	15
5th Year - Fall		**Fifth Year – Spring**	
Graduate Courses	6	Graduate Courses	6
Thesis	3	Thesis	3
SubTotal	9	SubTotal	9
Total	69	Total	69
		Grand Total	138

the end of the 5th year. It should be emphasized that a student in the combined BS/MS program may require more time to complete thesis requirements. Students must complete the BS/MS program in seven years.

Progression and Fallback Position: **Students must have a cumulative 3.4 GPA through the end of their junior year to be admitted to the combined Program and a continuing GPA of 3.0 or better to remain in the program. Students admitted to the Combined Program who fail to meet this academic standard will have a fallback position, which is to complete all requirements for the BS degree in Environmental Science. After completing the combined program, students will earn a BS and an MS in Environmental Science and Biology.**

Full-Time Students: **Students enrolled in ENV 704 are considered to be full-time students even though they may have less than 12 credit hours of courses.**

Independent Study: **Independent study allows students to explore unique areas of interest not addressed by currently offered courses or to explore to greater depth a topic covered in an existing course. A student is limited to three credits of Independent Study credit.**

Thesis Proposal: **A thesis proposal must be written by the candidate and be approved by the Thesis Advisory Committee prior to beginning thesis research.**

Tuition Rate: **The tuition rate is subject to college policies when students progress into graduate courses.**

Plan of Graduate Study/The Curriculum

Thirty credits or more are required for the M.S. portion of the BS/MS in Environmental Science and Biology. Of these 30 credits, 15 credits or more are to be at the 600/700 level. The remainder may be at the 700, 600 or 500 level as determined by the Thesis Advisory Committee in consultation with the candidate prior to the end of the seventh semester (normally the fall semester of the senior year). Thirteen credits of core courses are required as follows: Graduate Research Seminar (ENV 705), Thesis (ENV 705), Experimental Design (ENV 614). The Plan of Graduate Study may include supervised independent study which will not exceed three credits. The Plan of Graduate Study will reflect the student's expressed desire to concentrate in some area of Environmental Science and Biology. That is, courses selected will reflect the expertise required for their thesis, enabling them to help solve important environmental problems while providing a fully integrated, interdisciplinary approach to environmental science and biology. This educational outcome should provide our graduates with the background demanded in the marketplace. To accomplish this, the program will use strengths of the School of Letters and Sciences to provide a strong scientific education at the graduate level. Furthermore, several courses and internships open to Environmental Science students include extensive problem-

solving exercises provided by members of the environmental community (government, non-government organizations, and industry). Members of the environmental community have indicated a willingness to participate as mentors to students in these problem-solving exercises (e.g., Brockport's paid intern program with NYSDEC).

The courses making up the Plan of Study are to be listed on the Plan of Study Form and approved by all members of the Thesis Advisory Committee and the Department Chair. Courses may be from any department on campus, as long as they contribute to a coherent program of study (See Appendix B for a list of potential courses). Any changes in the Plan of Graduate Study must be approved by the Thesis Advisory Committee.

Level of Expectation of Students

The M.S. in Environmental Science and Biology is a rigorous, demanding thesis-based experience. The comprehensive exam, thesis defense and schedule of courses are designed to challenge students to think critically, independently and creatively, while providing the intellectual depth and breadth necessary to support the research formally developed in the thesis proposal.

The oral comprehensive exam is a 2 to 3-hour formal question and answer period required of every student. Exam questions from each faculty member are unannounced and may cover any aspect of environmental science and biology deemed important by the Thesis Advisory Committee.

The written thesis is reviewed by the Thesis Advisory Committee and revised by the candidate until deemed acceptable for the Thesis Defense by the Committee. The written thesis (ENV 704 – six credits) will be formally defended before the Thesis Advisory Committee. The defense, which takes place over a 2 to 3-hour period, concentrates on aspects of the thesis. That is, the students must be able to satisfactorily answer questions dealing with experimental design, methodology, hypotheses, conclusions, etc. developed in the thesis.

The Graduate Research Seminar (ENV 705), required of all students, is designed as four, one-credit seminars offered in successive semesters (total of four credits). Each seminar will critically review selected literature (one or two papers per week) on a topic determined by the faculty member. Over a two-year period, four different faculty will teach the course, providing students with breadth and depth on a series of topics.

Experimental Design (ENV 614 – 3 credits) is required of all students. We believe all students need to have a strong background in design of experiments to be successful. Parametric and non-parametric statistics as well as regression and ANOVA are covered. See Appendix F for the syllabus.

Syllabii of other 600 and 500-level elective courses are provided in Appendix F. 500-level courses are offered to graduate students and to selected undergraduate students who have taken prerequisite courses. In 500-level courses, graduate students face a significantly higher level of expectation than undergraduates. This is accomplished by one or more techniques including enhanced reading lists, extra papers or projects, presentations before the class, and often a more rigorous exam. For example, in Limnology (ENV 519) a total of 22 journal articles are read both by undergraduate and graduate students. In addition, graduate students must read five extra chapters (218 pages), write an additional term paper on some aspect of their thesis research and

answer extra exam questions. Representative syllabi of nineteen of the Department's 500 and 600-level courses are presented in Appendix F.

Requirements for the BS/MS in Environmental Science

1. Completion of the core requirements (38 credit hours) for the BS in Environmental Science (Appendix C).
2. Completion of General Education requirements of SUNY Brockport.
3. Completion of the Plan of Graduate Study as determined by the Thesis Advisory Committee in consultation with the candidate by the end of the first semester.
4. Successful completion of an oral comprehensive exam administered by the Advisory Committee by the beginning of the eighth semester of matriculation (normally the last semester of the senior year). The result of this exam may be used by the advisory committee to adjust the candidate's Plan of Graduate Study. In case of failure of this exam, ONE oral reexamination may be granted by the committee prior to the start of the fourth semester.
5. Required Core Courses (13 credits)
    a) Graduate Research Seminar (ENV 705 – 4 credits, one one-credit course per semester).
    b) Thesis (ENV 704 – 6 credits)
    c) Experimental Design (ENV 614 – 3 credits)
6. A minimum of 15 semester hours at the 600/700 level.
7. A minimum of 30 semester hours of credit with a cumulative GPA of 3.0 or higher in the courses listed in the Plan of Graduate Study:
8. A Thesis Defense of a written thesis administered by the Advisory Committee.
9. Submission of five copies of the defended thesis to the department secretary.
10. A minimum of 120 credits are required for graduation.

Quality of the Program: This is an ambitious program for a student. Nevertheless, quality will be maintained throughout the program. Admission to and continuation in the Combined Program is dependent on maintaining high academic standards – A GPA greater than 3.4 for the initial six semesters and greater than 3.0 for the graduate courses listed in the Plan of Graduate Study. Students in the "Combined BS/MS Program" must meet the same graduate course requirements as all other students in the "Traditional MS" program.

Transfer Credit: Up to six credits of graduate course work with a grade of "B" or better may be transferred from other institutions with the approval of the student's Thesis Advisory committee.

Program Requirements and Side by Side Comparison. A student enrolled in the "Traditional BS plus MS" program requires a minimum of 150 credits to graduate, while a candidate in the "Combined BS/MS" program is required to take 138 credits (Table 3). Note that the BS in Environmental Science has a set of "Core" courses required of all majors, but varying co-requisites and electives in its four areas of concentration. The concentration areas, or tracks, are Terrestrial Ecology, Aquatic Ecology, Earth Science and Environmental Chemistry.

Table 3. **Side by side comparison of the "Traditional BS+MS" program and the "Combined BS/MS" program. *=Required Courses.**

BS in Environmental Science	**Cr**		**Combined BS/MS in Environmental Science**	**Cr**	
Required Core Courses			**Required Core Courses**		
*ENV 202 Environmental Science	4		*ENV 202 Environmental Science	4	
*ENV 111 Principles of Biology	4		*ENV 111 Principles of Biology	4	
*ENV 303 Ecology	4		*ENV 303 Ecology	4	
*CHM 205 College Chemistry I	4		*CHM 205 College Chemistry I	4	
*CHM 206 College Chemistry II	4		*CHM 206 College Chemistry II	4	
*CHM 303 Analytical Chemistry	4		*CHM 303 Analytical Chemistry	4	
*CRJ 440 Environmental Law	3		*CRJ 440 Environmental Law	3	
*ESC 211 Intro. to Meteorol.	4		*ESC 211 Intro. to Meteorol.	4	
*GEL 201 Intro. Phys. Geol.	4		*GEL 201 Intro. Phys. Geol.	4	
*MTH 201 Calculus I **or** ENV 437 (Bio. Invest./Data Interp.) or ESC 350 (Comp. Methods)	3		*MTH 201 Calculus I **or** ENV 437 (Bio. Invest./Data Interp.) or ESC 350 (Comp. Methods)	3	
SUBTotal	**38**		**SUBTotal**	**38**	
Corequisite Courses for Tracks A and B Co- and Required Courses for Track C	Other TRKs	CHM TRK	**Corequisite Courses for Tracks A and B Co- and Required Courses for Track C**	Other TRKs	CHM TRK
A. Aquatic and Terrestrial Track (Org. Chem. – CHM 305)	4		**A.** Aquatic and Terrestrial Track (Org. Chem – CHM 305)	4	
B. Earth Science Track (Org. Chem. or Coll. Physics)	4		**B.** Earth Science Track (Org. Chem or Coll. Physics	4	
C. Environmental Chemistry Track Chm 301, 305, 306, Calc. II&III, Coll. Physics I&II		23	**C.** Environmental Chemistry Track Chm 301,305, 306, Calc. II&III, Coll. Physics I&II		23
SUBTotal for a Track	**4**	**23**	**SUBTotal for a Track**	**4**	**23**
Electives			**Electives**		
Aquatic and Terrestrial Track	20		Aquatic and Terrestrial Track	12	
Earth Science Track	20		Earth Science Track	12	
Environmental Chemistry Track		2-4	**Environmental Chemistry Track**		2-4
SUBTotal	**20**	2-4	SUBTotal	**12**	**2-4**
Plus General Education and other College Electives **SUBTotal**	**58**	57-59	**Plus General Education and other College Electives** SUBTotal	**54**	**45**
Total	**120**	120	Total	**108**	**108-110**
A) Master's Degree					
*Thesis Research ENV 704	6		*Thesis Research ENV 704	6	6
*Graduate Research Seminar (ENV 705)	4		*Graduate Research Seminar (ENV 705)	4	4
*Design of Experiment	3		*Design of Experiment	3	3

Electives determined by Thesis Advisory Committee	17	Electives determined by Thesis Advisory Committee	17	17
Total	30	Total	30	30
Grand Total of BS plus the traditional MS degree	150	**Grand Total of Combined BS/MS degree**	**138**	**138-140**

Appendix A. Current (or last known) job placement, thesis title and advisor of MS students advised by Norment, Haynes and Makarewicz in their former department.

Name	Year	Title of Thesis	Major Advisor	Position
Amering, Alan	1978	An organic energy budget for the New York State Barge Canal	Makarewicz	Kodak, Rochester,NY
Insalaco, Samual	1979	Routine determination of mirex and photomirex in fish tissue in the presence of polychlorinated hydrocarbons	Makarewicz	V.P. for European Affairs OH Materials Findlay,Oio
McCormack, Charles	1980	Stamina and feeding responses of rainbow trout fitted with dummy biotelemetry devices.	Haynes	Unknown
Calaban, Michael	1981	The effect of temperature and density on the amplitude of vertical migration of *Daphnia magna*.	Makarewicz	Water Quality Specialist NY Dept Environmental Conservation
McKellar, Dorothy	1982	Growth response of *Anacystis nidulans* to sodium, phosphate and potassium.	Makrewicz	Technical Assistant Stone and Webster, Boston, MA
Devault, David	1982	Effects of wind stress, wind speed and direction on phytoplankton in the nearshore region of Lake Michigan	Makarewicz	Toxics Chemical Coordinator Great Lakes Program, EPA Chicago, IL
Mellas, Ernest	1982	Effect of dummy telemetry transmitter attachments on swimming performance and behavior of rainbow trout and white perch.	Haynes	Professor of Biology, Monroe Community College, Rochester, NY.
Leupold, Maureen	1983	Blue-green algal mats from acidified lakes: Mat structure and pH response of algal isolates.	Makarewicz	Assistant Professor, Genesee Community College
Nettles, David	1983	Ecology of Lake Ontario brown trout. Assistant Professor, Paul Smith's College.	Haynes	NYSDEC, Atlantic salmon recovery coordinator for Lake Champlain, Raybrook, NY
Kent, Brian	1984	Mirex and its metabolites: Trends in levels of Lake Ontario coho and chinook salmon	Makarewicz	Director, Quality Assurance Program. General Electric, Syracuse, NY
Poulin, Kathleen	1985	A review and evaluation of regulatory, design and environmental impact considerations for Great Lakes recreation development.	Haynes	Environmental regulations specialist, Architectural and Engineering firms, Providence RI.
Firstencel, Heidi	1987	The Black Tern: Breeding ecology in upstate New York and results of pesticide residue analyses	Makarewicz	Research Associate, Cornell Ornithology Lab, Ithaca, NY
Lewis, Theodore	1987	Exchange of mirex between Lake Ontario and its tributaries.	Makarewicz	Research Associate, Research Foundation of SUNY
Gerber, Glen	1987	Movements and behavior of smallmouth bass and rock bass in southcentral Lake Ontario and two	Haynes	Endangered Species Coordinator, San Diego Zoo.

		tributaries. Ph.D. Vertebrate Behavior, University of Tennessee.		
Shea, Mary	1987	*Mysis relicta:* Production, vertical migration and life history of the Lake Ontario population.	Makarewicz	Water Treatment Plant Operator, Batavia, NY
Koapaha, Joutje	1989	*Leptodora kindtii*: Seasonal population abundance and food web interactions in Lake Ontario.	Makarewicz	Unknown, Returned to Indonesia
Fry, Barry	1989	Alpha and Pmax as functional indicators of aquatic ecosystems	Makarewicz	Director of Sales Columbia Analytical, Rochester, NY
Teal, Gregory	1989	Nutrient loadings into Conesus Lake	Makarewicz	Lab Director, Columbia Analytical, Rochester , NY
Puckett, Norma	1989	Trophic interactions and alewife predation in Conesus Lake	Makarewicz	Lab Director (retired), Van Lare STP
Letson, Michael	1991	An experimental test of the crayfish as a control mechanism for submerged aquatic macrophytes.	Makarewicz	CH2 Hill Consultants, Florida
Murray, Michael	1991	Residues of mirex and photomirex in eggs and fillets of Lake Ontario coho and chinook salmon.	Makarewicz	Analytical Lab, Buffalo, NY
Desormeaux, Eileen	1992	Trophic interactions: The relative importance of *Dreisena* filtration and *Daphnia* grazing on phytoplankton abundance and water clarity.	Makarewicz	School teacher, Chili High School
Aultman, Dana	1992	Spring thermal fronts and salmonine distributions in Lake Ontario.	Haynes	Statistician, Eastman Kodak Company
Brown, Gary	1993	Investigation of generalized watershed loading functions predictions on Sodus East Creek watershed	Makarewicz	Co-Director, Monroe Co. Environmental Health Dept
Crego, Gregory	1994	Effects of alewife predation on zooplankton community structure in Honeoye and Conesus Lakes	Makarewicz	Ph.D program, Mississippi
Stewart, Timothy	1993	Benthic macroinvertebrate community changes following zebra mussel colonization of southwestern Lake Ontario	Haynes	Assistant Professor, Dept. Natural Resources, Iowa State University
Miller, Steven	1994	An analysis of factors potentially limiting the abundance of the zebra mussel in Salmon Creek, Monroe County, New York.	Haynes	Regulatory analyst/fishery technician, NYSDEC, Avon, NY.
Joule, Stephen	1995	Amphibians of Iroquois National Wildlife Refuge: An assessment of community composition and heavy metal	Norment	Wildlife Biologist NYDEC, NY
Merner, Mary	1995	Trends in mirex residue in Lake Ontario salmon: 1997 to 1992	Makarewicz	Lab Analyst, VanLare STP, Rochester,NY
Verna, Tony	1995	The paleolimnology of Irondequoit Bay: Trophic history inferred from sedimentary diatom assemblages	Makarewicz	General Motors, Rochester,NY
Cloen, Carol	1996	Ultraviolet-B penetration in the water column and its effect on the American toad, *Bufo americanus*	Makarewicz	Natural Resource Adm., WA Dept of Natural Resources
Nale, Helen	1996	Benthic macroinvertebrates of Sandy Creek: Characterization and use in water quality analysis	Makarewicz	High school teacher, Penfield, NY

Cady, Bruce	1996	The effects of zooplankton grazing and nutrients on the phytoplankton of Conesus Lake, NY	Makarewicz	Kodak (Retired)
Ardizzone, Chuck	1996	Avian Community Structure in Managed Grasslands of Iroquois National Wildlife Refuge.	Norment	Wildlife Biologist, US Fish and Wildlife, Alaska
Tangorra, Philip	1996	Sediment chemistry of Irondequoit, NY	Makarewicz	Lab Analyst, Hudson Valley Health Department
Roberts, Chris	1996	Effects of Forest Fragmentation on the Reproductive Biology of Scarlet Tanagers (*Piranga olivacea*)	Norment	Ecologist, Nature Conservancy Rochester, NY
Lampman, Gregory	1997	Trophic interactions in Lake Ontario: The zooplankton- phytoplankton link	Makarewicz	Associate Project Manager, NYSERDA
Jones, Gregory	1997	Stopover Ecology of neotropical migrants on the south shore of Lake Ontario during spring migration	Norment	Ph.D. program, Univ. Florida
Lowie, Christopher	1998	Habitat requirements stream spawning walleye.	Haynes	Andromous fish passage coordinator U.S. Fish and Wildlife Service, Washington, DC
Terninko, John	1998	Watershed management plan for Wayne County	Makarewicz	Associate Director, Center for Environmental Information, Rochester,NY
Cook, George	1998	Chironomids as indicators of water quality in Irondequoit Creek.	Haynes	Aquatic ecology consultant, Rochester, NY
Weaver, Ken	1987	Alpha and betadiversity in zooplankton communities.	Makarewicz	Everglades Park, Florida
Arnold, Mary	2001	Paleolimnological analysis of Sodus Bay	Makarewicz	Private Consultant, Diatom Analysis
Robinson, Judy	2000	Follow-up vegetational and avifaunal surveys on wetlands restored through the U.S. Fish and Widlife Service	Norment	Environmental Specialist, Dept. of Env. Quality, Virginia
Bland, Stephen	2002	Causes of moss distribution in Alleghany primary order streams	Makarewicz	Analyst, VanLage STP, Rochester,NY
Burke, Brian	2000	Habitat suitability comparisons for creek and horneyhead chubs.	Haynes	Unknown
Ward, Roger		Factors affecting the benthic nepheloid layer	Makarewicz	Regulatory Affairs Officer, NYSDEC
Smith, Sue	2001	Nocturnal energy levels and stopover behavior of spring neotropical migrants along the southern Lake Ontario shoreline	Norment	Ph.D. program, U. Rhode Island
Bailey-Billhardt, Nichelle	2001	Ecological indicators of water quality in Irondequoit Creek.	Haynes	Director, Orleans C. Soil and Water Conservation District, Albion, NY
Damaske, Bestsy	2001	Long-term changes mirex levels in Lake Ontario salmon	Makarewicz	GC analyst, Battelle labs, Columbus, OH
Parnell, Nicholas	2002	Developing an Index of Biotic Integrity based on fish assemblages in small lakes in central and western New	Haynes	Senior Fisheries Scientist, Mote Marine Laboratory,

		York.		Sarasota, FL
Laxson, Corey	2002	Cercopagis pengoi distribution in Lake Ontario	Makarewicz	Assistant Professor, Paul Smiths College, NY
Krebs, Robin	2002	Breeding ecology of Henslow's Sparrows at Fort Drum, New York.	Norment	Env. Educator, Cornell Cooperative Extension
Walter, Ryan	2002	Association of reef fish and coral communities near San Salvador, Bahamas.	Haynes	Instructor, Monroe Community College, Rochester, NY
Rhyne, Randall	2002	Sampling and statistical considerations for steam invertebrate indices	Haynes	High School teacher, Fayetteville, NC
Hughes, Thomas	2002	Lake sturgeon ecology in the Niagara River	Haynes	Biologist, NYSDEC, Stony Brook, NY
D'Auito, Peter	2003	Factors controlling metaphyton in Conesus Lake	Makarewicz	Everglades Project, USGS, Florida

Appendix B. List of graduate electives available to candidates for the BS/MS of Science degree in Environmental Science and Biology. *Required Course. [1]Syllabi in Appendix F.

Courses	**Title** (credits**)**
700 LEVEL Courses	
*ENV 704	Thesis (6)
*ENV 705	Graduate Research Seminar (1)
LST 722	Great Lakes Issues (3)
600 LEVEL Courses	
[1]*ENV 614	Experimental Design (3)
[1]ENV 621	Water Chemistry (4)
ENV 692	Graduate Internship (3)
ENV 699	Independent Study (3)
ESC 636	Water Resources Topics (3)
NAS 663	Field Natural History (3)
PAD 679	Grant Writing and Management (1)
PAD 680	Public Policy (3)
500 LEVEL Courses	
[1]ENV 513	Topics in Plant Biology (3)
[1]ENV 519	Limnology (3)
[1]ENV 521	Limnology Lab (2)
[1]ENV 522	Population Biology (3)
[1]ENV 523	Pollution Biology (3)
[1]ENV 527	Animal Behavior (4)
[1]ENV 530	Ornithology (4)
[1]ENV 539	Conservation Biology (3)
[1]ENV 540	Herpetology (4)
[1]ENV 557	Field Biology (3)
[1]ENV 559	Mammalogy (4)
[1]ENV 583	Aquatic Invertebrates (4)
[1]ENV 584	Fish Ecology (3)
[1]ENV 588	Environmental Impact Analysis (3)
[1]ENV 590	Fishery Techniques (2)
ENV 595	Plant Ecology (4)
[1]ESC 511	Hydrology Lab (1)
[1]ESC 512	Hydrology (3)
ESC 516	Landform Analysis Lab (3)
[1]ESC 518	Watershed Sciences (3)
ESC 521	Air Pollution Meteorology (3)
ESC 555	Intro to Soil Science (4)
ESC 530	Geo Information Sciences (3)
[1]ESC 557	Geochemistry (3)
[1]ESC 562	Groundwater (4)
GEL 511	Stratigraphy and Sedimentology (3)
CRJ 540	Environmental Law (3)
BIO 526	Recombinant DNA (3)
BIO 567	Biochemistry I (4)
BIO 568	Biochemistry II (4)
BIO 515	Molecular Biology (3)

Appendix C

The Major in Environmental Science
Department of Environmental Science and Biology
Summary of Requirements

Core Courses (38 Credits)

ENV 202 Environmental Science
ENV 111 Principles of Biology
ENV 303 Ecology
CHM 205 College Chemistry I
CHM 303 Analytical Chemistry
CRJ 440 Environmental Law
ESC 211 Intro. to Meteorol.
GEL 201 Intro. Phys. Geol.
MTH 201 Calculus I **or**
ENV 437(Bio. Invest./Data Interp.) **or**
ESC 350 (Comp. Methods)

Concentration in Aquatic Ecology (24 credits)

15 elective credits chosen by advisement
3 co-requisite courses
CHM 305 Organic Chemistry I, ENV 419 Limnology, ENV 421 Limnology Laboratory

Concentration in Terrestrial Ecology (24 Credits)

20 elective credits chosen by advisement
1 co-requisite course (CHM 305 Organic Chemistry I)

Concentration in the Earth Sciences (24 Credits)
20 elective credits chosen by advisement
1 co-requisite courses (PHS 115 General Physics with Lab **or** PHS 201 College Physics with Lab **or** CHM 305 Organic Chemistry)

Concentration in Environmental Chemistry (35-37 Credits)

Required Courses (19 cr)

CHM 301 Chemical Safety
CHM 305 Organic Chemistry I
CHM 306 Organic Chemistry II
CHM 400 Chemistry Seminar
CHM 401 Chemistry Seminar
CHM 405 Physical Chemistry I
CHM 406 Physical Chemistry II
CHM 457 Environmental Geochemistry

Co-requisite Courses (14 cr)

MTH 202 Calculus II (F,S)
MTH 203 Calculus III (F,S)
PHS 201 College Physics I (F)
PHS 202 College Physics II (S)

Electives (2-4 credits)

Appendix D. Vitae of Environmental Science and Biology Faculty and Associate Faculty.

JOSEPH C. MAKAREWICZ

CURRENT POSITION: Distinguished Professor and Chairman, Department of Environmental Science and Biology, State University of New York at Brockport, Brockport, New York 14420 (716-395-5747), e-mail: Jmakarew@brockport.edu

EDUCATION:

1969 B.S. (Marine Biology, minor in Chemistry) University of Massachusetts - Dartmouth
1974 Ph.D. (Limnology, Water Resources) Cornell University

PROFESSIONAL EXPERIENCE:

1968	Research Assistant, Univ. of Georgia Marine Institute, Sapelo Island, Georgia. Salt marsh hydrology.
1969-1971	Graduate Teaching Assistant, Cornell University, Ithaca, NY
1971-1972	Instructor in Environmental Sciences, Bristol Community College, Fall River, Massachusetts.
1971-1972	Instructor in Biology, Southeastern Massachusetts Univ., North Dartmouth, Massachusetts
1972-1974	Research Assistant, Hubbard Brook Ecosystem Study, West Thornton, New Hampshire (Cornell University). Worked on long-term studies of acid precipitation and ion loss from forested watersheds.
1975-1976	Research Fellow, Edmund Niles Huyck Preserve, Rensselaerville, New York
1974-1978	Assistant Professor of Biology, SUNY at Brockport, NY
1974-present	Designed, equipped and maintained a fully equipped (A.A., G.C., Autoanalyser, phase scopes, etc.) certified (ELAP, NELAC) water quality laboratory: 1975-present. Directed 31 graduate students and over 50 undergraduate research projects; employ and supervise 2-3 technicians per year.
1980	Summer course, (taught "Structure and Function of Marine Plankton Ecosystems"), Univ. of Massachusetts, Nantucket Field Station
1978-1984	Associate Professor of Biology, SUNY at Brockport, NY
1984-1998	Professor of Biology, SUNY at Brockport, NY
1989-1990	Senior Fulbright Research Fellow, Max Planck Institute fur Limnologie, Germany
1992- present	Research Fellow: CILER (Cooperative Institute for Limnology and Ecosystems Research)
1991-1997	Chairman, Dept. of Biological Sciences, SUNY at Brockport
1998- 2000	Coordinator - Environmental Science major
1998-present	Distinguished Professor of Biological Sciences, SUNY Brockport, Brockport, NY
2000-2002	Director – Environmental Science Program
2000-present	Chairman – Department of Environmental Science and Biology

ADMINISTRATIVE:
Coordinator, Director and now Chair of the Department of Environmental Science and Biology (1998- present). SUNY College at Brockport.

Implemented and developed the curriculum and major and minor in Environmental Science and Biology.

Set-up a new department from “ground zero” into a functioning department with

four faculty and 3 staff.
Set- up web site, newsletter, space, budget, etc.
In the process of developing an MS degree in Environmental Science

Chairman: Lake Ontario Facilities Development. As Chair, we have developed a campus-wide consensus report that has been approved by the President of the college to initiate the development of a research/education facility on the shores of Lake Ontario. At present, ~$100,000 in funding has been received for preliminary drawings. Activities completed include negotiations with NYS Parks and Recreation on siting of the facility at a State Park, development of brochures, and initiatives for funding through federal and state sources. This included meetings and presentations with appropriate state and federal congressional representatives. Preliminary architectural drawings are now underway with Bergmann Associates. Inc.

Chairman, Department of Biological Sciences (1991-1997), SUNY College at Brockport.
14 faculty, 2 research associates, 4 service personnel, 300+ undergraduate majors, 30 graduate students.
Developed and instituted an undergraduate assessment procedure.
Developed and published a departmental newsletter.
Doubled enrollments in the undergraduate major in Biological Sciences through a multifaceted program that included sending the newsletter to community colleges instructors,
letter writing and a phone campaign to students.
Implemented the major in Medical Technology
Lead the development and passage through administrative channels of the interdisciplinary major (Earth Science, Biology and Chemistry) in Environmental Sciences.
Received funding from the college to set up a 24 station computer facility for the sciences.
Initiated the renovation of the Lennon Hall Science building through a National Science Foundation Infrastructure grant with matching funding from the SUNY Construction Fund. Total amount of funds attracted for renovation was $13 million.
Hired five new faculty and developed and hired a new position titled instructional support assistant.

Project Leader - Brockport, Great Lakes Consortium Development (1982-1984).
Responsible for Brockport's interest in developing a research consortium of colleges for research on the Great Lakes. Brockport and SUNY Oswego received two development grants for this project. As of 1986 the Consortium was officially formed and received funding from the New York State Assembly and has an annual budget of $150,000.

Chairman, Articulation & Recruitment Committee (1982-1984), SUNY Brockport.
Responsible for developing articulation programs with community colleges for the Department of Biological Sciences. This necessitated working with administrators at various colleges while negotiating 10 successful agreements. The strategy developed has served as a model for other programs and increased enrollment by approximately 20% within the department within two years.

Principal Investigator of contracts and grant.
Administered and managed 73 grants and contracts ($4,400,000+).

RESEARCH AGENDA:

Applied aspects of environmental science, lake and watershed resource management, including such topics as watershed and ecosystem approaches to determining point and non-point sources of nutrients in urban and rural watersheds, hydrologic and nutrient budgets, indicators of successful remediation, strategies and demonstrations projects for reducing nutrient and organic hydrocarbon from watersheds, atmospheric deposition rates on ecosystems, uptake dynamics of chlorinated hydrocarbons in aquatic food-webs, top-down and bottom-up effects on

plankton community structure, environmental education, environmental impact statements, plankton as indicators of success of the phosphorus reduction program in the Great Lakes and methods of reducing pesticide levels in fish grown in polluted waters. Because of my former association with the Hubbard Brook Ecosystem Study in New Hampshire, I also have continuing interest in acid precipitation and analysis using the small watershed approach.

GRANTSMANSHIP: Administered and managed over 73 grants and contracts ($4,400,000+).

NOAA. MERHAB. Tier-based monitoring for toxic Cyanobacteria in the lower Great Lakes. 2002-2007. $2.5 million. Co-PI. Collaboration with SUNY ESF, Vermont, Tennessee.

United State Department of Agriculture. 2002-2005. (CRREES). Experimental manipulation of entire watersheds through best management practices: Nutrients fluxes, fate and transport $680,000. Project Leader. Collaboration with RIT, SUNY Geneseo and Cornell Cooperative Extension.

New York Sea Grant. 1999-2001. Cercopagis – a new exotic zooplankter in Lake Ontario. $220,000. Project Leader. Collaboration with Cornell, Windsor and Guelph.

U.S. Environmental Protection Agency. 1999-2001. Cercopagis – a new exotic zooplankter in Lake Ontario. $80,000.

Niagara County Soil and Water Conservation District. 1998-2000. Identification of point and non-point nutrient sources in Niagara County, Project Director. $26,200.

Great Lakes Research Consortium. 1988-1999. Travel funds, workshops, seed grants. $26,500.

Great Lakes Research Consortium. 1998. Research Equipment. SeaBird CTD. $25,000.

Orleans County Soil and Water Conservation District. 1998-2000. Identification of point and non-point nutrient sources in Johnson Creek. Project Director. $47,050.

New York Sea Grant. 1996-1999. Impact of pen culture of salmonines in Georgian Bay. Project Director. $174,815.

Great Lakes Research Consortium. 1998. Developing spatially-explicit models for assessing production potential of streams. Co-PI. $23,767.

Wayne County Soil and Water Conservation District. 1996-1998. Evaluation of wetland in removal of milk-house wastes. P.I. $2,300.

Oswego County Soil and Water Conservation District. 1997-2001. Evaluation of muckland demonstration project using a wetland to improve water quality. Project Director. $42,050.

Water Quality Task Force - Canandaigua Lake. 1997-2001. Determination of the impact of nutrient loading on Canandaigua Lake. Project Director. $94,000.

Department of Education. 1996-97. The Environmental Quality of Watersheds. Environmental Studies Project. Development of a training manual for secondary schools for watershed analysis. Co-PI. $6,500.

Monroe County Health Department. 1997. Carbon dating of a sediment core from Long Pond. $1,500.

National Science Foundation. 1997. Stressed stream analysis: addressing real environmental problems to stimulate undergraduate faculty. Co-P.I. $132,423.

Environmental Protection Agency. 1996-99. Chemical and biological factors affecting trophic status in Lakes Lake Erie and Huron: A canonical correspondence analysis approach. P.I. $124,575.

Great Lakes Protection Fund. 1996- 1998. Atrazine movement in agricultural watersheds of Wayne County. P.I. $41,496.

Ontario County Water and Soil Conservation District. 1994-1996. Evaluation of sources of nutrient loading in Sandy and Eight Mile Creeks. P.I. $55,666.

West Valley Nuclear Services Company. Biological sampling. $7,500.

Onondaga Lake Management Conference. 1995. Limnology of Onondaga Lake. P.I.

$70,650.

National Science Foundation. 1995. Stressed stream analysis: addressing real environmental problems to stimulate undergraduate faculty. Co-P.I. $113,593.

Environmental Protection Agency. 1995. Phytoplankton and zooplankton composition of Lake Michigan and Huron. P.I. $100,000.

National Science Foundation and New York State Construction Fund. 1994. Infrastructure Improvement Grant for Renovating the Lennon Hall Science building. P.I. $914,738.

National Science Foundation. Stressed stream analysis: addressing real environmental problems to stimulate undergraduate faculty. 1993. Co-P.I. $89,941.

Environmental Protection Agency. Summer, 1993-94. Limnology Practicum: Graduate training course on Lake Huron aboard the R.V. Lake Guardian. Topics : Coring, sediment and water analysis, plankton and chlorophyll analysis, etc. Project Leader. $6,331.

Monroe County Health Department. 1993. Monitoring four ponds in the town of Greece. $2,300.

Oswego Soil and Conservation District. 1993-98. Nutrient loads into Lake Neatewanta. $39,286.

New York Sea Grant. 1990-94. Uptake of organic contaminants in Lake Ontario fish: Can fish be grown in contaminated waters for commercial sale? Co-P.I. $62,662.

Livingston County Planning Department. 1990-1993. Land use as a determinant of watershed chemistry, Conesus Lake. P.I.

Keuka Lake Association . 1992-1997. Water chemistry of Keuka Lake. $33,969.

New York Sea Grant Institute. 1993-94. Phosphorus cycling in zebra mussel populations relative to hydrologic loading of phosphorus. P.I. $120,440.

Seneca County Soil and Conservation District. 1989-1997. Evaluations of nutrient movement from Kendig Creek to the Seneca River. P.I. $45,650.

Wayne County Soil Conservation District, 1987-1997. Rural stream runoff: Nutrient loading effects on Sodus Bay, Lake Ontario. P.I. $98,972.

Great Lakes Research Consortium. 1989. Equipment (G.C) and student support. $13,500.

O'Brien and Gere Engineers. 1989. Webster Lake water supply project. P.I. $27,660.

Monroe County Health Department, 1987-1989. Urban runoff: a watershed approach (surfactant analysis). P.I. $7,985.

Environmental Protection Agency, 1988-1989. Evaluation of the phosphorus reduction plan in the offshore waters of Lakes Erie, Michigan and Huron 1985. Project Director. $115, 500.

New York Sea Grant Institute. 1990-91. Trophic interactions: relative importance of Dreissena and Daphnia grazing on phytoplankton abundance and water clarity. $6,050.

Great Lakes Research Consortium. 1990. Concentration and metabolism of pesticides at the air-water interface in Lake Ontario. $20,000.

Environmental Protection Agency, 1987-1993. Acid Precipitation monitoring at Grand Isle, Olcott and Sodus Bay. Project Director. $61,854.

National Science Foundation, 1987-1989. Environmental impact analysis for secondary school teachers. Co-P.I. $110,000.

New York Sea Grant Institute. 1987. Macrophyte development on Wautoma Shoals. $7,000.

U.S. Army Corps of Engineers. 1989. Sediment core sampling, Olcott Harbor, NY. $4,443.

Woodward Clyde Consultants, 1988. Hudson River survey in preparation for the Halfmoon Co-Generation Plant. Project Director. $15,000.

Research Foundation of SUNY. 1989. Research equipment in the aquatic sciences. $23,364.

NYS Deaprtment of Agriculture and Markets. 1988. Uptake and retention of contaminants by fish cultured on prepared diets in waters of Lake Ontario. $37,500.
Rochester Gas and Electric Company. 1988. Uptake and retention of contaminants by fish cultured on prepared diets in waters of Lake Ontario. $27,000.
Environmental Protection Agency, 1985-1988. Chemical and biological processes of the nearshore of Lake Ontario. Project Director. $231,516.
Monroe County Health Department. 1987. Urban runoff: a watershed approach. $32,000.
Environmental Protection Agency, 1987. Acid precipitation monitoring at Grand Isle, Olcott and Sodus Bay. $56,700.
Livingston County Health Department, 1985-1986. Water quality and watershed analysis of Conesus Lake. Project Director. $31,766.
Environmental Protection Agency, 1984-1985. Distribution and abundance of phytoplankton in relation to zooplankton stocks in Lakes Erie, Michigan and Huron, 1983. Project Director. $81,524.
Livingston County Health Department.1985. Watre Quality and watershed analysis of Conesus Lake. $32,330.
Environmental Protection Agency, 1984. Development of a computer retrieval system for phytoplankton data from the Great Lakes. Project Director. $18,333.
New York State Sea Grant, 1984. Dynamics of zooplankton in relation to forage fish stocks in Lake Ontario. Project Director. $22,477.
Research Foundation of the State of New York, 1983. Grant to develop a Lake Ontario Research Consortium. Project Leader. $20,000.
Department of Transportation, 1983. Fishery survey of the Champlain Section of the NYS Barge Canal. Project Director. $42,840.
Department of Education, 1983. Development of an interdisciplinary course in Population Biology. Funded by the Creating Connections Project Director, Center for Professional Development, Wichita State University. Project Director. $1,500.
Department of Transportation, 1982. Evaluation of dredging in the NYS Barge Canal (Erie Canal). Principal Investigator. $1,000.
Army Corps of Engineers, 1981-1982. Evaluation of potential dredging in Buffalo Harbor, Lake Erie, New York. Principal Investigator. $45,132.
Research Incentive Fund Award, 1981. SUNY Brockport. Principal Investigator. $800.
Environmental Protection Agency, 1979. Multivariate analysis of fifty years of plankton data from water intake cribs at Chicago, Illinois. Principal Investigator. $29,230.
National Oceanic and Atmospheric Administration (NOAA). 1978. Long-term analysis of phytoplankton of Lake Michigan at Chicago. Principal Investigator. $18,000.
Army Corps of Engineers, 1978. Biological Study - Cape Vincent, New York. Coinvestigator. $10,425.
Army Corps of Engineers, 1978. Biological Study - Oak Orchard, New York. Coinvestigator. $10,425.
National Science Foundation, 1977. Instructional Scientific Equipment Program. Principal Investigator. $9,200.
Army Corps of Engineers, 1977. Food habits of Irondequoit Bay fishes. Coinvestigator. $2,900.
Army Corps of Engineers, 1977. Spring movement and spawning activity of fish in the vicinity of the proposed dredging operations, Irondequoit Bay, New York. Coinvestigator. $2,300.
Research Foundation of the State of New York, 1977. Niche analysis of a zooplankton community. P.I. $3,250.
Edmund Niles Huyck Preserve, 1977. Taxonomic identification of a rotifer found in Lake Myosotis, New York. Principal Investigator. $770.
Army Corps of Engineers, 1976. Impact of opening Irondequoit Bay by dredging to

Lake Ontario. Coinvestigator. $13,865.

Research Foundation of the State of New York, 1976. Niche analysis of a zooplankton community. P.I. $3,200.

Edmund Niles Huyck Preserve, 1975. Niche analysis of a zooplankton community. Principal Investigator. $2,000.

Edmund Niles Huyck Preserve, 1975. Generation times of zooplankton in eutrophic lakes. Research Fellowship. $2,000.

New York State Division of Parks and Recreation, 1974-1976. An ecological study of the Rochester-Lockport section of the New York State Barge Canal. $56,022.

RESEARCH/CONSULTING:

Have provided expertise to lawyers (e.g., Kehoe & Kehoe). Engineering firms (e.g., Malcolm-Pirnie, Beak, Ebasco, Halfmoon Generation, Saiki, Larsen, Ecology and Environment) and private associations (e.g., Port Bay Association, Black Lake Association).

PUBLICATIONS - JOURNALS AND BOOKS:

Duggan, S.A. Bailey, R. I. Colautti, D. Gray, **J. C. Makarewicz**, and H. J. MacIsaac. **Submitted** Biological Invasions in Lake Ontario: Past, Present and Future. In: **The Status of Lake Ontario**. M. Munawar, Editor

Laxson, C.L, Kerry N. McPhedran, Joseph C. Makarewicz, Irena V. Telesh and Hugh J. MacIsaac. 2003. Effects of the invasive cladoceran Cercopagis on the lower food web of Lake Ontario. **Freshwater Biology. In press.**

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SEMINARS AND INVITED PRESENTATIONS including keynote speaker

Available on request.

AWARDS

Among 38 scientists honored by the Chancellor of the SUNY system for outstanding scholarship and grantsmanship. 2002

Recipient of the Chandler Meisner Award for best manuscript, International Association of Great Lakes Research. 2002.

Named a member of the "Environmental 25". In celebration of the Rochester Center for Environmental Studies 25th Anniversary, 25 people from New York State were named "Environmentalist" of the quarter century. 1999.

Excellence in Environmental Teaching. Center for Environmental Information, 1999.

Career Achievement Award. Research Foundation of the State University of New York and SUNY Brockport. 1997, 1998 and 2002.

New York State Conservation Districts Special Award. In recognition of his desire to educate and advance Soil and Water Conservation Districts in their understanding of water resources management.

Phi Beta Delta College International Scholar's Award. 1995.

SUNY Chancellor's Award for Excellence in Teaching. 1994.

Senior Fulbright Research Fellow. 1989/90. Max Planck Institute fur Limnologie. Germany.

Fellow of CILER. Elected member of the Cooperative Institute for Lake Experimental Research.

Research Achievement Award. Research Foundation of the State University of New York and SUNY Brockport. 1992.

Wayne County Soil and Water Conservation District. Acknowledgment and Appreciation for assistance and excellence in the development of the District's water quality monitoring program.

Researcher of the Month Award (1984) - SUNY Researcher

Faculty Research Award (1983) - Society of Sigma Xi at Brockport

New York State Scholar Incentive Award (1974)

Commonwealth of Massachusetts Scholarship (1968)

COURSES TAUGHT:

Water Quality Analysis, Water Chemistry, Stress Stream Analysis, Limnology Practicum, Limnology, Environmental Impact Analysis, Population Biology, General Biology, Aquatic Biology, General Chemistry, Marine Plankton Ecology.

PROFESSIONAL SERVICE

Executive and Personnel Committee, Sponsored Programs Advisory Council, Research Foundation of the State of New York (1991-present).

Member of Board of Representatives, Great Lakes Consortium (1985-present)

Chairman, Search Committee for Director of Sponsored Research

Scientific Advisory Committee, New York Sea Grant and Federation of Lake Associations

Reviewer for NSF (24 grants)

Member of Board of Representatives, Great Lakes Consortium (1985-present)

Chairman, Search Committee for Director of Sponsored Research

Reviewer for EPA (8 grants)

Reviewer for New York Sea Grant (16 grants)

Reviewer for USDA (2 grants)
Individual and panel reviewer for the Great Lakes Research Consortium (>50 grants)
Reviewer for the Great Lakes Protection Fund (4 grants)
Reviewer for Ohio Sea Grant (3 grants)
Reviewer for Michigan Sea Grant (one grant)
Reviewer for Louisiana Sea Grant (one grant)
Reviewer for ERDA (one grant)
Reviewer for Hydrobiologica
Reviewer for International Association for Great Lakes Research
Reviewer for Ohio Journal of Sciences.
Reviewer for the Canadian Journal of Aquatic Biology and Fisheries
Reviewer for Ecology
Reviewer for Physiology and Behavior
Reviewer for Limnology and Oceanography
Reviewer for Canadian Journal of Aquatic and Fish Biology
Reviewer for Journal of Freshwater Ecology
Session Convener (Ecology), Annual Meeting of the Rochester Academy of Sciences (1976, 1980)
Liaison Officer. Rochester Meeting of the International Association of Great Lakes Research.
Program Committee. Oswego Meeting of the International Association of Great Lakes Research.
Session Convener. Rochester Academy of Sciences. Brockport and St. John Fisher Meetings.
Program Committee and Participant. 1983. Buffalo Symposium on Research at SUNY Colleges.
Session Chair - Lake Ontario Fishery. 1983. Symposium on Lake Ontario. Center for Environmental Information. This is an International Symposium on the status of Lake Ontario held in Rochester, N.Y.
Sea Grant Advisory Committee. 1985-1992. New York Sea Grant.
Planning Committee. 1986. Decisions for the Great Lakes.
Undergraduate Course Improvement Grant reviewer. 1986-1989. Research Foundation of the State of New York.
Great Lakes Initiative Development Committee. 1987. Formed cooperatively by Sea Grant and the National Marine Fishery Service to develop collaborative research on the Great Lakes.
Session Convener. 1991. The Recovery of Lake Erie. Buffalo Meeting of the International Association of Great Lakes Research.
Special Editor. 1993. The Restoration of Lake Erie. Journal of Great Lakes Research. Volume 19(2).
Chair. 1991-1997. Student Award Committee. Great Lakes Research Consortium Annual Meeting.

JAMES M. HAYNES

CURRENT POSITION: Professor, Department of Environmental Science and Biology, State University of New York, Brockport, New York 14420 jhaynes@brockport.edu

EDUCATION:

Carleton College, Northfield, MN - B.A., Biology, 1973
University of Minnesota - M.S., Fisheries, 1975
University of Minnesota - Ph.D., Ecology, 1978

PROFESSIONAL EXPERIENCE

Professor (1991 to present), Associate Professor (1984-1990) and Assistant Professor (1978-83) of Environmental Science and Biology, SUNY College at Brockport. Teach undergraduate and graduate courses in Environmental Impact Analysis, Fisheries Science/ Management, Fish Biology/Ecology, Fishery Techniques/Fish Identification, Pollution Biology, and Marine Biology/Geology-Bahamas, plus undergraduate courses in Environmental Science, Eco-Citizenship, Biological Oceanography, Evolution, and laboratories for General Biology. Lead instructor or project director for nine National Science Foundation Undergraduate Faculty Enhancement and National Dissemination programs: Summer Practicum for Applied Environmental Problem-Solving (Great Lakes Research Consortium) and Stressed Stream Analysis (Center for Applied Aquatic Science & Aquaculture).

RESEARCH

Project Director or Co-PD for 25+ grants and contracts totaling $2+ million. Supervised one post-doctoral research associate, 10 M.S. graduates and 2-5 students/technicians per semester/summer since 1978. Chairman, Monroe County Water Quality Management Advisory Committee that oversaw preparation of a water quality Remedial Action Plan for the Rochester Embayment of Lake Ontario, 1989-93 (continue to serve on County technical committees that devise and implement remedial actions, 1993 to present). Coordinated 10 week Decisions for the Great Lakes program in 1986 that involved 30 citizen participants and 33 speakers. Organized a 3-day, 15 participant workshop in 1987 to develop a fisheries research agenda for Lake Ontario. Chaired Department Budget Committee that distributed more than $20,000 annually, 1985-90. Chaired Department Personnel Committee (appointment, promotion, tenure decisions), 1992-96. Secretary-Treasurer, Education Section, American Fisheries Society, 1988-92. Chairman, NY Chapter, American Fisheries Society, Annual Meeting Program Committee, 1980. Chairman, American Fisheries Society Career Opportunities Committee, 1984, 1987 (helped initiate the national JOBSource computerized employment service). Administer Department scientific collections permit, 1980-present.

Principal or Co-Principal Investigator for 30+ grants and contracts for fisheries and aquatic ecology research and education in the lower Great Lakes region totaling $2.7 million since 1978, including impacts of zebra mussels on native benthic invertebrate communities; invertebrates and fish as indicators of aquatic system health; radiotelemetry/netting studies of movements, habitats and diets of fishes in Lake Ontario; impacts of thermal discharges, dredging and recreation development on coastal ecology and fishes in Lakes Ontario/Erie and the St. Lawrence River; photographic and illustrated guides to Great Lakes, Hudson River, and Bahamas fishes; and development of aquaculture ponds and a wet laboratory for aquatic organism culture at SUNY Brockport. Sabbatical leave research in 1988 with the NOAA/NMFS SE Fisheries Center Mississippi Laboratories explored techniques for determining the distribution and abundance of aquatic animals along environmental fronts and reefs in the Gulf

of Mexico and SW Atlantic Ocean. Used radio telemetry to study movements and habitats of chinook salmon and white sturgeon in relation to hydroelectric dams and gas super-saturation in the Snake and Columbia Rivers with Battelle Pacific Northwest Laboratories, 1975-78. These research and related teaching efforts have resulted in 25+ refereed-publications, 20+ major technical reports, a book, and over 60 professional presentations since 1976.

PUBLICATIONS

Lowie, C.E.*, and J.M. Haynes. 2001. Comparison of walleye habitat suitability index (HSI) information with habitat features of a walleye spawning stream. J. Freshwater Ecol.: 621-631.

Haynes, J.M., T.W. Stewart and G.E. Cook*. 1999. Benthic macroinvertebrate communities in southwestern Lake Ontario following invasion of Dreissena: continuing change. J. Great Lakes Res. 25(4):828-838.

Haynes, J.M. 1998. Stressed stream analysis: addressing real environmental problems in local communities to stimulate undergraduate science faculty and students. J. Coll. Sci. Teach. 28(1):43-51.

Haynes, J.M. 1997. Zebra mussels and benthic macroinvertebrate communities of southwestern Lake Ontario and selected tributaries: unexpected results? Great Lakes Res. Rev. 3(1):9-16.

Miller, S.J.*, and **J.M. Haynes**. 1997. Factors limiting colonization in western New York creeks by the zebra mussel, Dreissena polymorpha. J. Freshwater Ecol. 12(1):81-88.

Haynes, J.M. 1995. Thermal ecology of salmonids in Lake Ontario. Great Lakes Res. Rev. 2(1):17-22.

Stewart, T.W.*, and **J.M. Haynes**. 1994. Benthic macroinvertebrate community changes following zebra mussel (Dreissena polymorpha) invasion of southwestern Lake Ontario. J. Great Lakes Res. 20(2):479-493.

Aultman, D.C.*, and **J.M. Haynes**. 1993. Spring thermal fronts and salmonine sport catches in Lake Ontario. N. Amer. J. Fish. Mgmt. 13(3):502-510.

Haynes, J.M., G.P. Gerber* and J.K. Buttner. 1989. Responses of sport fishes to thermal discharges in the Great Lakes: is Somerset Station, Lake Ontario, different? J. Great Lakes Res. 15(4):709-718.

Haynes, J.M., and G.P. Gerber*. 1989. Movements and temperatures of radiotagged salmonines in Lake Ontario and comparisons with other large aquatic systems. J. Freshwater Ecol. 5(2):197-204.

Gerber, G.P.*, and **J.M. Haynes**. 1988. Movements and behavior of smallmouth bass, Micropterus dolomieui, and rock bass, Ambloplites rupestris, in southcentral Lake Ontario and two tributaries. J. Freshwater Ecol. 4(4):425-440.

Olson, R.A.*, J.D. Winter, D.C. Nettles* and **J.M. Haynes**. 1988. Resource partitioning in summer by salmonids in south-central Lake Ontario. Trans. Amer. Fish. Soc. 117(6):552-559.

Brett, B.L., G.P. Gerber* and **J.M. Haynes**. 1987. Low genetic variability in northern populations of fish. Isozyme Bulletin. 20:29.

Nettles, D.C.*, **J.M. Haynes**, R.A. Olson and J.D. Winter. 1987. Seasonal movements and habitats of brown trout (Salmo trutta) in southcentral Lake Ontario. J. Great Lakes Res. 13(2):168-177.

Haynes, J.M., D.C. Nettles*, K.M. Parnell*, M.P. Voiland, R.A. Olson* and J.D. Winter. 1986. Movements of rainbow/steelhead trout (Salmo gairdneri) in Lake Ontario and a hypothesis for the influence of spring thermal structure. J. Great Lakes Res. 12(4):304-313.

Haynes, J.M., and C.J. Keleher*. 1986. Movements of Pacific salmon in Lake Ontario in spring and summer: evidence for wide dispersal. J. Freshwater Ecol. 3(3):289-297.

Keleher, C.J.*, **J.M. Haynes**, D.C. Nettles*, R.A. Olson* and J.D. Winter. 1985. Fall movements of Pacific salmon in Lake Ontario and several tributaries. NY Fish and Game J.

32(2):167-175.

Mellas, E.J.*, and **J.M. Haynes**. 1985. Swimming performance and behavior of rainbow trout (Salmo gairdneri) and white perch (Morone americana): effects of attaching telemetry transmitters. Can. J. Fish. Aquat. Sci. 42(3):488-493.

Haynes, J.M., and D.C. Nettles*. 1983. Fall movement of brown trout in Lake Ontario and a tributary. NY Fish and Game J. 30(1):39-56.

Haynes, J.M., G.W. Thorburn and J.E. Gannon. 1983. Environmental assessment: melding classroom instruction with problem-solving experience. J. Coll. Sci. Teach. 12(6):394-398.

Haynes, J.M. 1983. Finding salmon and trout in Lake Ontario. Water Spectrum 15(1):30-37, and Charter Industry Trade News 1(1):25-30 (1985).

Haynes, J.M., and J.C. Makarewicz. 1982. Comparison of benthic communities in dredged and undredged areas of the St. Lawrence River at Cape Vincent, NY. Ohio J. Sci. 82(4):165-170.

Haynes, J.M., and R.H. Gray. 1981. Diel and seasonal movements of white sturgeon (Acipenser transmontanus) in relation to Columbia River temperatures. Fishery Bulletin. 79(2):367-370.

Haynes, J.M., and R.H. Gray. 1980. Influence of Little Goose Dam on upstream movements of adult chinook salmon. Fishery Bulletin 78(1):185-190.

Gray, R.H., and **J.M. Haynes**. 1979. Spawning migration of adult chinook salmon carrying external and internal radiotransmitters. J. Fish. Res. Board Can. 36(9):1060-1064.

Haynes, J.M., R.H. Gray and J.C. Montgomery. 1978. Seasonal movements of white sturgeon (Acipenser transmontanus) in the mid-Columbia River. Trans. Amer. Fish. Soc. 107(2):275-280.

Gray, R.H., and **J.M. Haynes**. 1977. Depth distribution of adult chinook salmon (Oncorhynchus tshawytscha) in relation to gas supersaturated water. Trans. Amer. Fish. Soc. 106(6):617-620.

* student author

Books and Media

Haynes, J.M. 1996. Taxonomic collection (204 species) and slide set (338 species) of sea weeds, invertebrates and fishes near San Salvador, Bahamas. Bahamian Field Station.

Haynes, J.M., and N.J. Frisch. 1993. Illustrated Guide to Hudson River Fishes. Hudson River Foundation.(book and 120 slides)

Haynes, J.M., N.J. Frisch and G.A. Bucher. 1984. Photographic and Illustrated Key of Selected New York Fishes. SUNY College at Brockport, NY. 80 slides.

Proceedings

Haynes, J.M., and R.H. Gray. 1979. Effects of external and internal radiotransmitter attachments on adult chinook salmon. Second International Conference on Wildlife Biotelemetry Proceedings 2:115-128.

Gannon, J.E., **J.M. Haynes** and G.W. Thorburn. 1981. Melding classroom instruction and real-world problem-solving in the aquatic sciences. Fishery Educator's Section Special Session Proceedings. American Fisheries Society 111th Annual Meeting, Albuquerque, NM. 10 p.

Kuechle, V.B., **J.M. Haynes** and R.A. Reichle. 1989. Use of small computers for telemetry data collections. Pages 695-699, In: C.J. Amlaner, Jr. (Ed.), Proceedings of the Tenth International Symposium on Biotelemetry. University of Arkansas, Fayetteville, AR.

Technical Reports

Haynes, J.M., R.C. Dilcher, C.J. Norment, J.A. Zollweg and N.F. Parnell. 2003. Biological study of Irondequoit Bay. New York Dept. of State/Monroe County. 226 p.

Parnell, N.F., R.P. Walter and **J.M. Haynes**. 2003. Assessing the status of fish communities in Lamoka and Waneta Lakes. The Lamoka-Waneta Lakes Association. 22 p.

Makarewicz, J.C., **J.M. Haynes**, R.C. Dilcher, J.C. Hunter, C.J. Norment and T.W. Lewis. 2000. Biological survey of Yanty Creek Marsh. NY Office of Parks, Recreation and Historic

Preservation. 183 p.
Haynes, J.M., and J.N. McNamara. 1998. Indicators of change in water quality and environmental health in the Irondequoit Creek wetland complex. Final report to Monroe Co. Dept. of Health. Rochester, NY. 48 p.
Haynes, J.M. (Ed.). 1999, 1997, 1995, 1993, 1991. New curricula developed by undergraduate faculty participants in the GLRC/NSF summer practicum. Final reports to the National Science Foundation by the Great Lakes Research Consortium Summer Practicum for Applied Environmental Problem-Solving. 298, 567, 517, 444, 252 p.
Haynes, J.M. (Ed.). 1998, 1996, 1994. New curricula developed by faculty participants in the CASSA/NSF stressed stream analysis program. Final reports to the National Science Foundation by the Center for Applied Aquatic Science and Aquaculture Stressed Stream Analysis Program. 396, 358, 350 p.
Haynes, J.M. 1995. Community ecology of the Niagara County artificial reef and nearby natural areas of Lake Ontario. Final report to U.S.Fish and Wildlife Service. Amherst, NY. 38 p.
Haynes, J.M. 1994. Survey of Buttonwood Creek, Monroe County, NY to determine habitat availability for and relative abundance of a species of special concern, the pirate perch (Aphredoderus sayanus). Final report to Monroe Coounty Dept. of Transportation. Rochester, NY. 23 p.
Haynes, J.M. 1990. Methods for sampling reef fishes, with emphasis on the red snapper (Lutjanus campechanus), in the Gulf of Mexico: is stock assessment feasible? NOAA/NMFS/SEFC Mississippi Laboratories. Pascagoula, MS. 66 p.
Haynes, J.M. 1988. Behavior and thermal habitats of fish at Somerset Station and in Lake Ontario: two-pump vs. three-pump operation. Data report to the NY State Electric and Gas Corp. Binghamton, NY. 74 p.
Haynes, J.M., G.P. Gerber and J.K. Buttner. 1987. Thermal ecology of selected sport fishes near Somerset Station and in Lake Ontario. Final report to the NY State Electric and Gas Corp. Binghamton, NY. 118 p.
Haynes, J.M., G.P. Gerber and J.K. Buttner. 1987. Movements and temperatures of salmonids and centrarchids near Somerset Station and in Lake Ontario in 1986. 1986 annual report to the NY State Electric and Gas Corp. Binghamton, NY. 252 p.
Haynes, J.M., and G.P. Gerber. 1987. Activity and survival of winter-impinged fish at Somerset Station. Data report to the NY State Electric and Gas Corp. Binghamton, NY. 28 p.
Haynes, J.M., J.K. Buttner and G.P. Gerber. 1986. Movements and temperatures of selected sport fishes near Somerset Station and in Lake Ontario in 1985. 1985 annual report to the NY State Electric and Gas Corp. Binghamton, NY. 188 p.
Haynes, J.M., J.K. Buttner and G.P. Gerber. 1985. Movements and temperatures of brown trout and rainbow/steelhead trout near Somerset Station and in Lake Ontario in fall 1984. 1984 annual report to the NY State Electric and Gas Corp. Binghamton, NY. 36 p.
Haynes, J.M., and C.J. Keleher. 1984. Spring and summer locations and temperatures of Pacific salmon in Lake Ontario. Final report to the Ontario Ministry of Natural Resources/ Ontario Charter Boat Assoc./St. Catharines Fish and Game Assoc. 32 p.
Haynes, J.M., J.C. Makarewicz and R.C. Dilcher. 1979. Biological survey of Cape Vincent Harbor, NY. Final report to the U.S. Army Corps of Engineers, Buffalo, NY. 50 p.
Haynes, J.M. 1978. Movement and habitat studies of chinook salmon and white sturgeon. Special report to the U.S. Department of Energy by the Battelle Pacific Northwest Laboratories, Richland, WA. PNL-2471. 65 p. (also my Ph.D dissertation)
Makarewicz, J.C., **J.M. Haynes** and R.C. Dilcher. 1979. Biological survey of Oak Orchard Harbor, NY. Final report to the U.S. Army Corps of Engineers, Buffalo, NY. 53 p.
Makarewicz, J.C., R.C. Dilcher, **J.M. Haynes** and K.A. Shump. 1982. Biological survey of the Buffalo River and Outer Harbor of Buffalo, NY. Data report to the U.S. Army Corps of Engineers. Buffalo, NY. 155 p.
Makarewicz, J.C., R.C. Dilcher, **J.M. Haynes** and K.A. Shump. 1982. Biological survey of the Buffalo River and Outer Harbor of Buffalo, NY. Final report to the U.S. Army Corps of Engineers. Buffalo, NY. 117 p.

Poulin, K.A., and **J.M. Haynes**. 1986. Construction techniques, environmental impacts and laws/regulations for recreation development on the Great Lakes: an annotated bibliography and discussion of critical needs in New York. Sea Grant First Impressions Report. NY Sea Grant Institute, SUNY at Stony Brook, NY. 71 p.

External Funding

Haynes, J.M., J.J. Pagano and S.T. Wellman. 2003-2005. RAP progress in the Rochester Embayment of Lake Ontario: Population monitoring and levels of bioaccumulative chemicals of concern in mink, a sentinel species. New York Great Lakes Protection Fund.

Haynes, J.M. 2002. Biological study of Irondequoit Bay. Monroe County Department of Planning and Development.

Haynes, J.M. 2002-2004. Fishery study of Waneta and Lamoka Lakes. Waneta-Lamoka Lake Association.

Haynes, J.M., S.M. Millar and M.M. Hluchy. 2001-2006. Assessment and evaluation supplement to "Regional Workshops Led by Successful Innovators and Experienced Investigators." National Science Foundation.

Haynes, J.M. and M.M. Hluchy. 2000-2005. Disseminating successful undergraduate science curriculum development, adaptation and implementation strategies and CCLI grant writing techniques: regional workshops led by successful innovators and experienced investigators. National Science Foundation.

Haynes, J.M. 2000-2002. Co-director of the Great Lakes Research Consortium.

Haynes, J.M. and J.C. Makarewicz. 2000-2002. Measuring RAP progress in the Rochester Embayment of Lake Ontario: determining baseline levels of bioaccumulative chemicals of concern in air, water, sediment and sentinel species. NY Great Lakes Protection Fund.

Haynes, J.M., J. Chiarenzelli, A. Nelson, J. Pagano and T.C. Young. 1999-2001. Academic program assessment. Great Lakes Research Consortium.

Tisch, N., **J.M. Haynes** and C. Mayer. 1999. Impact assessment of the introduced amphipod, Echinogammarus ischnus, in the Great Lakes. Great Lakes Research Consortium.

Makarewicz, J.C. and **J.M. Haynes** (Principal Investigators) and R.C. Dilcher, J.C. Hunter and C.J. Norment (Co-Principal Investigators). 1999. Biological survey of Yanty Creek Marsh. NY Office of Parks, Recreation and Historic Preservation.

Haynes, J.M. (Lead Instructor), and seven co-investigators. 1998-99, 1996-97, 1994-95, 1993-93, 1990-91. Great Lakes Research Consortium summer practicum for applied environmental problem-solving: new approaches and techniques for undergraduate faculty. National Science Foundation, Undergraduate Faculty Enhancement Program.

Haynes, J.M. (Project Director), and six co-investigators. 1997-98, 1995-96, 1993-94. Stressed Stream Analysis: addressing real environmental problems to stimulate undergraduate faculty. National Science Foundation, Undergraduate Faculty Enhancement Program.

Haynes, J.M. 1996-97. Macroinvertebrate survey, sampling strategy, and biotic index for the Irondequoit Creek wetland. Monroe County Dept. of Health.

Haynes, J.M. 1994-95. Community ecology of the Niagara County artificial reef and nearby natural areas of Lake Ontario. U.S. Fish and Wildlife Service.

Haynes, J.M. 1994. Survey of Buttonwood Creek, Monroe County, NY to determine habitat availability for and relative abundance of a species of special concern, the pirate perch (Aphredoderus sayanus). Monroe County Dept. of Transportation.

Haynes, J.M. 1992-93. Deployment and recovery of sediment samplers and side-scan sonar in Lake Ontario. SUNY at Stony Brook.

Haynes, J.M. 1991. Relative fish abundance at an artificial reef in Lake Ontario. Niagara County Department of Planning and Industrial Development.

Haynes, J.M. 1990. Sediment sampling and analysis, Braddock Bay, Lake Ontario. Town of Greece, NY.

Haynes, J.M., and N.J. Frisch. 1989-90. Illustrated guide and slide set for Hudson River fishes. Hudson River Foundation.

Haynes, J.M. and J.C. Makarewicz. 1989. Sediment core sampling, Olcott Harbor, NY. U.S.

Army Corps of Engineers.
Haynes, J.M. 1987-88. Attraction of fishes to the thermal plume at Somerset Station under two-pump operating conditions. Stone and Webster Engineering Corp.
Haynes, J.M., D.J. Stewart and R.G. Werner. 1987-88. Dynamics of salmonine predation in Lake Ontario, 1983-88. Great Lakes Research Consortium.
Buttner, J.K., and **J.M. Haynes**. 1987-88. Expanding and enhancing existing freshwater research and education facilities at the SUNY College at Brockport. U.S. Department of Education.
Haynes, J.M. 1987. Developing a trophic web model for the Lake Ontario salmonid fishery: identifying basic and applied research needed to test the model. Great Lakes Research Consortium.
Haynes, J.M. 1986-87. Activity and survival of winter-impinged fish at Somerset Station. NY State Electric and Gas Corp.
Haynes, J.M. 1986. Decisions for the Great Lakes. Great Lakes Tomorrow, Inc.
Haynes, J.M. 1984-87. Thermal ecology of Lake Ontario fishes. NY State Electric and Gas Corp.
Haynes, J.M. 1984. Summer locations and temperatures of Pacific salmon in western Lake Ontario. Ontario Ministry of Natural Resources/Ontario Charter Boat Association.
Haynes, J.M. 1983. Recreation facility design and environmental impacts on the Great Lakes. NY Sea Grant/NOAA.
Haynes, J.M. 1983. Photographic and illustrated key of selected NY fishes. Faculty Grant for the Improvement of Undergraduate Instruction. SUNY.
Haynes, J.M., and J.D. Winter. 1981-83. Movements, distributions and habitat preferences of Lake Ontario salmonids. NY Sea Grant/NOAA.
Haynes, J.M. 1980. Spawning movements of Lake Ontario brown trout using radiotelemetry. University Awards Program. SUNY.
Haynes, J.M., and J.C. Makarewicz. 1978-79. Biological survey of Cape Vincent Harbor, NY. U.S. Army Corps of Engineers.
Makarewicz, J.C., and **J.M. Haynes**. 1978-79. Biological survey of Oak Orchard Harbor, NY. U.S. Army Corps of Engineers.

CHRISTOPHER NORMENT

CURRENT POSITION: Associate Professor, State University College at Brockport, Department of Environmental Science and Biology, Brockport, New York
(585) 395-5748 cnorment@brockport.edu

EDUCATION

1992 PhD, Systematics and Ecology, University of Kansas, Lawrence, KS.
1982 M.S., Zoology, Washington State University, Pullman, WA .
1975 B.S., Biology, Southern Oregon State College, Ashland, OR.

PROFESSIONAL EXPERIENCE

1998-present Associate Professor (tenured), Department of Environmental Science and Biology, State University of New York, College at Brockport, Brockport, NY. Instruct courses in Mammalogy, Animal Behavior, Conservation Biology, Ornithology, Herpetology, Wildlife Ecology, General Ecology
1993-1998 Assistant Professor, Department of Biological Sciences, State University of New York, College at Brockport, Brockport, NY.
1990-1993 Lecturer, School of Basic Life Sciences, University of Missouri, Kansas City, MO. Instruct courses in Introductory Biology, Comparative Vertebrate Anatomy.Data Manager, Kansas Biological Survey, University of Kansas, Lawrence, KS.
1990-1994 1992-1993 Adjunct Curator, Museum of Natural History, University of Kansas, Lawrence, KS.
1988-1992 Graduate teaching assistant, Division of Biological Sciences, University of Kansas, Lawrence, KS.
1983-1988 Secondary School Science Teacher, Westover School, Middlebury, CT.
1979-1982 Graduate teaching assistant, Department of Zoology, Washington State University, Pullman, WA.
1975-1976 Biologist, United States National Park Service, University of Nevada, Las Vegas, NV.

RESEARCH

Current Avian community structure, breeding biology, and conservation biology in northeastern grasslands; population biology of Frasera speciosa (Gentianacea); reproductive ecology of Zonotrichia sparrows; breeding biology of Australian Pipits (Anthus spinoletta)spring stopover ecology of Neotropical migrant songbirds; wildlife use of created and natural wetlands.
1989-1991 Comparative breeding ecology of Harris' Sparrows and White-crowned Sparrows in the Northwest Territories, Canada.
1984-1991 Breeding biology of American Pipits, pollination and population biology of Frasera speciosa.
1980-1981 Avian community structure in a subalpine forest/alpine tundra ecotone, Wyoming.
1975-1976 Ecology of feral burros, Death Valley National Monument, CA.

Additional Teaching Experience
1983-1988 Director, Outdoor Program, Westover School, Middlebury, CT.
1979-1983 Instructor and Chief Instructor, Pacific Crest Outward Bound School,
1979-1984 Portland, OR.
1974 Environmental Education Specialist, Youth Conservation Corps, Ashland, OR

External Funding (recent)
2003-4 New York State Biodiversity Research Institute ($18,983 for research on

grassland birds in the St. Lawrence River Valley)

2003 Fish and Wildlife Service ($15,000 for grassland bird research)

2002 Fish and Wildlife Service ($19,000 for grassland bird research)

2000-2003 Biological Study of Irondequoit Bay. (J. M. Haynes, Principal Investigator, $50,000).

2001 Fish and Wildlife Service ($4,800 for grassland bird research)

2001 New York State Department of Environmental Conservation ($4,900 for wetlands research).

2000 Bergen Swamp Preservation Society ($1,600 for small mammal study in Bergen Swamp)

1999 Department of Environmental Conservation ($3,600 for study on Grasshopper Sparrows)

1999 New York State Office of Parks, Recreation and Historic Preservation ($46,000 for biological inventory of Yanty Creek Marsh, J. Makarewicz, principal investigator).

1998-1999 Great Lakes Research Consortium ($20,000 for stopover ecology research with Dr. T. Donovan of SUNY ESF).

1998 Department of Defense, Fort Drum, NY. ($40,000 for study on breeding biology of Henslow's Sparrow)

1997 National Science Foundation Grant: Stressed Stream Analysis: Addressing Real Environmental Problems to Stimulate Undergraduate Science Faculty and Students (J. M. Haynes, Principal Investigator, $120,000).

1997-1998 United States Fish and Wildlife Service Challenge Grants ($15,500 for grassland bird research)

1997-1998 United States Fish and Wildlife Service Challenge Grant ($14,700 for wetlands research).

1994 - 1996 United States Fish and Wildlife Service Challenge Grants ($24,200 for grassland bird research)

1995 - 1998 Department of Environmental Conservation, New York State, ($2,700 for grassland bird research)

1996 Bergen Swamp Preservation Society ($1,100 for assessment of bog turtle populations)

1994 National Science Foundation Grant: Stressed Stream Analysis: Addressing Real Environmental Problems to Stimulate Undergraduate Science Faculty and Students (J. M. Haynes, Principal Investigator, $113,593).

PUBLICATIONS

Balent, K. and C. J. Norment. 2003. Demographic characteristics of a Grasshopper Sparrow (Ammodramus savannarum) population in a highly fragmented landscape in western New York. Journal of Field Ornithology 74: 341-348.

Norment, C. J. 2002. Grassland bird conservation in the Northeast. Auk 119: 271-279.

Norment, C. J., C. A. Ardizzone, and K. Hartman. 1999. Habitat relations and breeding biology of grassland birds in western New York: Management Implications. Studies in Avian Biology 19: 112-121.

Ardizzone, C. A. and C. J. Norment. 1999. Experimental analysis of nest predation: Effects of habitat and nest distribution. Studies in Avian Biology 19: 122-127.

Roberts, C. R. and C. J. Norment. 1999. Effects of plot size and habitat characteristics on breeding success of Scarlet Tanagers. Auk 116:73-82.

Norment, C. J., A. Hall, and P. Hendricks.1998. Important bird and mammal records in the Thelon River Valley, Northwest Territories: Range expansions and possible explanations. Canadian Field-Naturalist 113: 1-11.

Norment, C. J., P. Hendricks, and R. Santonocito. 1998. Golden-crowned Sparrow (Zonotrichia atricapilla). In the Birds of North America (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences.

Jones, G. and C. J. Norment. 1998. Absence of breeding readiness in Neotropical and long-distance migrant landbirds during spring stopover. Condor 100: 373-375.
Norment, C. J. and M. E. Fuller. 1997. Breeding season frugivory by Harris' Sparrows (Zonotrichia querula) and White-crowned Sparrows (Zonotrichia leucophrys) in a Low Arctic ecosystem. Canadian Journal of Zoology 75: 670-679
Norment, C. J. 1995. Prebasic (postnuptial) molt in free-ranging Harris' Sparrows in the Northwest Territories, Canada. Canadian Field-Naturalist 109:470-472.
Norment, C. J. 1995. Incubation patterns in Harris' Sparrows and White-crowned Sparrows in the Northwest Territories, Canada. Journal of Field Ornithology 66:553-563.
Norment, C. J. 1994. Breeding site fidelity in Harris' Sparrows in the Northwest Territories, Canada. Canadian
Field-Naturalist 108:234-236.
Hendricks, D. P. and C. J. Norment. 1994. Hatchability of American Pipit eggs in the Beartooth Mountains, Wyoming. Wilson Bulletin 106: 392-399.
Norment, C. J. 1993. Nest site characteristics and nest predation in Harris' Sparrows and White-crowned Sparrows in the Northwest Territories, Canada. Auk 110: 769-777.
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Norment, C. J. 1992. The comparative breeding biology of Harris' Sparrows and Gambel's White-crowned Sparrows in the Northwest Territories, Canada. Condor 94: 955-975.
Hendricks, P. and C. J. Norment. 1992. Effects of a severe snowstorm on alpine and subalpine populations of nesting American Pipits. Journal of Field Ornithology 63:331-338.
Norment, C. J. 1991. Bird use of forest patches in the subalpine forest-alpine tundra ecotone of the Beartooth Mountains, Wyoming. Northwest Science 65: 1-9.
Norment, C. J. 1988. The effect of nectar-thieving ants on the reproductive success of Frasera speciosa (Gentianacea). American Midland Naturalist 120:331-336.
Norment, C. J. 1987. A comparison of three methods for measuring tundra arthropod abundance and its an ecology. Northwest Science 61:191-198.
Hendricks, D. P. and C. J. Norment. 1986. Additions to the alpine avifauna of the Beartooth Mountains, Wyoming.
Murrelet 67:90-92.Norment, C. J. 1985. Observations on the annual chronology for birds in the Warden's Grove area, Thelon River, Northwest Territories, 1977-1978. Canadian Field-Naturalist 99:471-483.
Norment, C. J. 1980. Breech presentation of the fetus in a pregnant muskox. Journal of Mammalogy 61:776-777.
Douglas, C. L. and C. J. Norment. 1979. Ecology of feral burros in Death Valley National Monument. Pp. 373-383 in Proceedings of the first conference on scientific research in the National Parks. R. M. Linn, ed. US National Park Service, Washington, D. C.
Douglas, C. L. and C. J. Norment. 1977. Habitat damage by feral burros in Death Valley. Desert Bighorn Council Transactions 21:21-25.
Norment, C. J. and C. L. Douglas. 1977. Ecological studies of feral burros in Death Valley National Monument. Coop. National Park Studies Unit, University of Nevada, Las Vegas, NV. 17:1-132.
Norment, C. J. and M. Morgan. 2003. Breeding biology of grassland birds in western New York: Management implications. Cooper Ornithological Society 75th Annual Meeting, Flagstaff, AZ.
Norment, C. J. 2002. Status of grassland bird research and conservation in the Northeast. The Northeast Natural History Conference VII, Albany, New York.
Norment, C. J., and H. Halbritter. 2001. Suitability of switchgrass (Panicum) stands as habitat for grassland birds. American Ornithologist's Union Annual Meeting, Seattle, WA.
Krebs, R., Norment, C. J., and S. Joule. 2001. Breeding ecology of Henslow's Sparrows at Fort Drum, NY. American Ornithologist's Union Annual Meeting
Norment, C. J. 2000. Grassland bird conservation in the Northeast: the problem of temporal scale. Society for Conservation Biology Annual Meeting, Missoula, MT.

Norment, C. J. 2000. Grassland bird conservation in New York: A temporal perspective. New York Natural History Conference VI, Albany, NY.

Norment, C. J. 1999. Grassland management and its influence on grassland birds. United States Fish and Wildlife Service Region 5 Refuge Biologists. Workshop, National Conservation Training Center, Shepardstown, WV.
(Invited presentation)

Norment, C. J., A. Hall, and P. Hendricks. 1998. Climate change and avian range expansions in the forest-tundra transition of the Northwest Territories: Difficulties in evaluating alternative hypotheses. North American
Ornithological Congress, St. Louis, MO.

Jones, G. A and C. J. Norment. 1998. Stopover of Neotropical and temperate landbird migrants on the south shore of Lake Ontario during spring migration. North American Ornithological Congress.

Norment, C. J. 1996. Grassland bird habitat relations and breeding biology in western New York. New York Natural History Conference, Albany New York.

Norment, C. J., C. A. Ardizzone, and K. Hartman. 1995. Habitat relations and breeding biology of grassland birds in western New York: Management Implications. International Conference on Conservation and Ecology of
Grassland Birds, Tulsa, OK.

Ardizzone, C. A. and C. J. Norment. 1995. Experimental analysis of nest predation: Effects of habitat and nest
distribution. International Conference on Conservation and Ecology of Grassland Birds.

Norment, C. J. 2002. (Book review). Blackhearts: Ecology in Outback Australia. Auk 119: 577-580.

Norment, C. J. 2000. Arctic Profile: Francis Harper (1886-1972). Arctic 53: 72-75.

Norment, C. J. 1999. Effects of grassland bird management on nongame bird community structure and productivity. Final report to United States Fish and Wildlife Service; 152 pp.

Norment, C. J. 1999. (Book Review) Habitat characteristics of of some passerine birds in western North American taiga, by Brina Kessel. Arctic 52: 311-312.

Norment, C. J. 1991. (Book Review) Journal of a Barrenlander: W. H. B. Hoare, 1928-1929, edited by Sheila Thomsen. Arctic 44: 261-262.

Norment, C. J. 1989. In the North of Our Lives: A Year in the Wilderness of the Northwest Territories. Down East Books, Camden, ME. (book)

Norment, C. J. 1988. Arctic Profile: C. H. D. Clarke (1909-1981). Arctic 41:256-257. Professional Societies: American Ornithologist's Union; Arctic Institute of North America; Cooper Ornithological Society; Society for Conservation Biology; Australian Institute for Alpine Studies.

GEOFFREY C. GARDNER

CURRENT POSITION:

Assistant Professor, Department of Environmental Science and Biology, State University of New York, Brockport, New York 14420 ggardner@brockport.edu

EDUCATION

The State University of New York at Albany December 2002
Ph.D. Ecology, Evolution and Behavior program
Dissertation: Persistence and Spread of *Cryptococcus fagisuga*, the initiating agent in Beech Bark Disease
Advisor: Dr. George Robinson

The State University of New York at Albany May 2002
Graduate Certificate in Geographic Information Systems And Spatial Analysis

Union College June 1995
Bachelor of Science in Biology, magna cum laude

PROFESSIONAL EXPERIENCE

SUNY College at Brockport August 2002 to Present
Qualified Academic Rank, Lecturer
ENV 303 Ecology
ENV 495/595 Plant Ecology
ENV 499 Independent Study: Evolution and Impact of Angiosperms,
ENV 437/614 Biological Investigation and Data Analysis

The State University of New York at Albany September 1995 to August 2002
Instructor
Biology 320 Ecology
Teaching Assistant
Biology 110 Introduction to Biology I,
Biology 111 Introduction to Biology II
Biology 455/555 Plant Ecology,
Biology 497/601 Restoration Ecology
Study Group Facilitator Biology 110

RESEARCH

New York State Department of Environmental Conservation September 2000 – June 2002
Division of Water. Bureau of Flood Protection. Water GIS section Internship

The State University of New York at Albany May 1996 to August 1998
Research Assistant
Field assistant in survey of E.N. Huyck Preserve.
Computer work in study of epidemics using TEMPEST computer program.

Union College Summer 1994
Research Assistant
Field assistant in study of eutrophication of an Adirondack lake.

PUBLICATIONS

Gardner, G. 2001. Beech scale (*Cryptococcus fagisuga*) dynamics in an aftermath forest. In Edmund Niles Huyck Preserve and Biological Research Station 1996-1997 Combined Annual Report. Wyman, R.L and C.J.P Barker Editors. 33-40.

Duryea, M., T. Caraco, G. Gardner, W. Maniatty, and B.K. Szymanski, 1999. Population dispersion and equilibrium infection frequency in a spatial epidemic. Physica D. 132: 511-519.

Caraco, T, G.Gardner, W. Maniatty, E. Deelman and B.K. Szymanski. 1998b. Lyme disease: self-regulation and pathogen invasion. Journal of Theoretical Biology. 193: 561-575.

Caraco, T, M. Duryea, G.Gardner, W. Maniatty, and B.K. Szymanski. 1998a. Host spatial heterogeneity and extinction of a SIS epidemic. Journal of Theoretical Biology. 192: 351-561.

Gardner, G.C. 2000. The role of density dependence in small scale population dynamics *of Cryptococcus fagisuga*. New York State Natural History Conference, Albany, NY. April 2000.

Wright, N.D. G.R. Robinson, I. Peters Robinson, and G.C. Gardner. 1999. Spatial variability of interactions between a native host tree and a non-native parasite. Symposium on the ecology of invasive species. New Haven, CT. February 1999.

Gardner, G.C. 1998. Beech scale dynamics in an aftermath forest. New York State Natural History Conference, Albany, NY. October 1998.

Examples of Associate Faculty

Mark R. Noll, Ph.D.

EDUCATION

Ph.D. University of Delaware, Newark, Delaware, May 1989 in Soil Physical Chemistry.
M.S. New Mexico Institute of Mining and Technology, Socorro, New Mexico, May 1985 in Geology.
B.S. Millersville University, Millersville, Pennsylvania, May 1981 in Earth Science-Geology.

EXPERIENCE

Associate Professor, State University of New York College at Brockport, Department of The Earth Sciences, Sept. 2003 to present, Asst. Prof. Aug. 1997 to Aug. 2003. Responsible for courses in Physical Geology (majors and non-majors), Mineralogy, Geochemistry, Groundwater.
Research Hydrogeologist, Applied Research Associates, Inc., Tyndall AFB, FL, and Dover AFB, DE, March 1994 to August 1997. Director of Field Operations and Research for the USAF Groundwater Remediation Field Laboratory.
R&D Geochemist, DuPont Chemicals R&D, Environmental Resources Group, Jackson Lab, Deepwater, NJ, April 1991 to March 1994
Adjunct Faculty, Delaware County Community College, Media, PA, September 1992 to March 1994.
Geologist, DuPont Environmental Remediation Services, Wilm., DE, March 1990 to April 1991
Remedial Project Manager, U.S. EPA, Region III, Philadelphia, Pa., April 1989 to March 1990.
Science Teacher, Tower Hill School, Wilmington, De., February 1988 to June 1988. I was responsible for teaching 2 sections of ninth grade physical science and 3 sections of eighth grade earth science.

GRANTS AND CONTRACTS AT BROCKPORT

Principal Investigator

1. **Noll, M.R.** and J. Makarewicz. 2002. Impact of Anoxia and Alum on Phosphorous Release From Internal Load in Irondequoit Bay, Rochester Embayment Area of Concern. Great Lakes Protection Fund, **$134,216**.
2. **Noll, M.R**. 2001. Development of Environmental Geochemistry Modules Across an Earth Science Curriculum. National Science Foundation, DUE CCLI-A&I Program, **$36,892**.
3. **Noll, M.R.** 2002. Geochemical characterization of water and sediment, Cazenovia and Scajaquada Creek, NY. Subcontract from S. Inamdar from USEPA Great Lakes Basin Program**. $4776**.
4. **Noll, M. R.** 2002. Sediment Modelling of the Buffalo River Watershed, Water and Sediment Analysis for Model Testing. Subcontract from S. Inamdar from USACOE**. $6169**.
5. **Noll, M.R**. and Hunter J.C. 2001. Evaluation of Anthropogenic Effects to the Ellison Park Wetland II. Research contract with USGS, **$5014**.

Co-Principal Investigator

6. Zollweg, J.A., **M.R. Noll** and W.J. Autin. 2002. Black Creek Watershed State of the Basin Report. USEPA through the NYDOH, **$12000**.
7. Autin, W.J. and **Noll, M.R**. 2000. Quaternary Geologic Mapping of the Holley 7.5 Minute Quadrangle. U.S. Geological Survey, Educational Geological Mapping Program, **$3500**.
8. Hunter, J, Harris, P., **Noll, M**, and Zollweg, J. 2000. Sacramento - San Joacim Delta Marsh Evaluation and Restoration Plan. Research contract with Habitat and Restoration Assessment Team, Inc., **$4800**
9. Hunter, J.C. and **Noll, M.R**. 1999. Evaluation of Anthropogenic Effects to the Ellison Park Wetland. Research contract with USGS, **$5014**.

10. Silverstone, S., DeFeo, B., English, B., Esler, M., Harris, P., Maliekal, J., **Noll, M**., Rao, T., Schlecht, K., Tahar, M., and Zollweg, J. 1999. Science and Math Summer Leadership Institute. GTE FOCUS Program, **$28,624.**
11. Autin, W.J. and **Noll, M.R**. 1998. Quaternary Geologic Mapping of the Hamlin 7.5 Minute Quadrangle. U.S. Geological Survey, Educational Geological Mapping Program, **$5000**.

Collaborator

12. Collaborator with J. Makarewicz and I. Bosch (principal investigators), 2002. Experimental Manipulation of Entire Watersheds through BMPs: Nutrient Fluxes, Fate and Transport and Biotic Response, USDA, **$667,998**.

PUBLICATIONS AT BROCKPORT

(* denotes undergraduate student co-author)

Journal Articles

Noll, M.R. 2003 (in press). Building Bridges Between Field and Laboratory Studies in an Undergraduate Groundwater Course. Journal of Geoscience Education.

Other Peer Reviewed Documents

Noll, M.R., Hunter, J.C. and *Brennan, J. Change in the Structure and Species Composition of a Coastal Wetland of Lake Ontario 1999-2001. Technical report to the U.S. Geological Survey, Ithaca, NY, June, 2002.

Noll M.R., *Perry, N.C., and *Delobbe, M. 2000. Uptake of Heavy Metals by Forage Crops from Sludge Amended Soils. Proceedings of the 11th International Conference on Heavy Metals in the Environment, Ann Arbor, Michigan.

Hunter, J.C., **Noll, M.R**., and *Perry, N.C. Change in the Structure and Species Composition of a Coastal Wetland of Lake Ontario 1991-1999. Technical report to the U.S. Geological Survey, Ithaca, NY, June, 2000.

Conference Abstracts

*Buckwalter, M.J. and **Noll, M.R.** 2003. Reassessment of Wetland Soil Quality Using Spatial Variability Factors. Geological Society of America Abstracts w/ Program, v.35 no.5.

*Hanselman, D.P. Jr. and **Noll, M.R.** 2003. Meter Scale Variability of Soil Properties in a Lake Ontario Coastal Wetland. Geological Society of America Abstracts w/ Program, v.35 no.5.

*Raduns, N.R. and **Noll, M.R.** 2003. Rapid Determination of Exchangeable Cations Using an Acclerated Solvent Extraction Procedure. Geological Society of America Abstracts w/ Program, v.35 no.5.

*White, D.J. and **Noll, M.R.** 2003. Characterization of P Distribution in Sediment Cores from an Alum Treated Lake. Geological Society of America Abstracts w/ Program, v.35 no.5.

Noll, M.R. 2002. Incorporating Geochemistry in an Earth Science Curriculum. Geological Society of America Abstracts w/ Program, v.34 no.5.

*Gruendle, K.V. and **Noll, M.R.** 2002. Magnetite Dissolution Rates in Acidic Solutions. Geological Society of America Abstracts w/ Program, v.34 no.5.

*Hanselman, D.P. Jr. and **Noll, M.R.** 2002. Spatial Variation in Wetland Soil Properties as Influenced by Hydrology and Elevation in a Coastal Wetland of Lake Ontario. Geological Society of America Abstracts w/ Program, v.34 no.5.

*Wachtman, J., **Noll, M.R.** and Zollweg, J.A. 2002. Spatial and Temporal Analyses of Water Quality in Subcatchments of Irondequoit Creek Using GIS. Geological Society of America Abstracts w/ Program, v.34 no.5.

*Taylor, R., *Harrington, L. and **Noll, M.R.** 2002. Determination of Exchangeable Base Cations and Ammonium in Wetland Soils by Ion Chromatography. Agronomy Abstracts, Indianapolis.

Noll, M.R. and *Seiter, J.M. 2001. Modeling Rates of Erosion Using Anthropogenic Heavy Metals. Geological Society of America Abstracts w/ Program, v.33 no.5.

Noll, M.R., and Hunter, J.C. 2000. Variations in Nutrient and Heavy Metal Distribution and Bioavailability in an Urban Wetland as Influenced by Soil Chemical and Hydrological Properties. Geological Society of America Abstracts w/Programs. V.32, No.5.

Hunter, J. C., Zollweg, J.A., and **Noll, M. R**. 2000. Influence of Hydrology and Geomorphology Upon Biodiversity in a Coastal Wetland of Lake Ontario. New York State Wetland Forum, 2000 Annual Spring Meeting, Binghamton, NY.

Noll, M.R., and *Lewis, S.C. 1999. Effects of pH and Particle Size on Wollastonite Dissolution. Geological Society of America Abstracts w/Programs.

Noll M.R., and *Perry, N.C. 1999. Bioavailability of Mo and Cu from Sewage Sludge Amended Soils. Agronomy Abstracts, Salt Lake City.

Noll, M.R., and *Brown, G.H., 1998. Effect of Anion Species on Pb Desorption from Clay Minerals. Geological Society of America Abstracts w/ Programs. V.30, No.5.

Other Reports

*Sperber, S. T., *Sheehan, K, *Natal, H, Natel, E. , Autin, W. J., Zollweg, J., and **Noll, M.** (Compilers), 2001. Quaternary Geologic Map of the Holly, New York 7.5- Minute Quadrangle. USGS EDMAP Report

*Sperber, S. T., *Dilorenzo, J., *Petrus, J., *Evans, F., *Peck, B., *Wakeley, S., Autin, W. J., **Noll, M**., Zollweg, J., (Compilers), 2000, Quaternary Geologic Map of the Hamlin, New York 7.5- Minute Quadrangle. USGS EDMAP Report.

PUBLICATION PRIOR TO BROCKPORT

Patents

Process For Isolating Contaminated Soils. U.S. Patent Number 5,370,478. 1995

Journal Articles

19. Sadusky, M.C., Sparks, D.L., **Noll, M.R.**, and Hendricks, G.J. 1987. Kinetics and Mechanisms of Potassium Release from Sandy Middle Atlantic Coastal Plain Soils. Soil Sci. Soc. Am J., V.51, No.6.

Chapter in Edited Volume

20. Kyle, P.R., and **Noll, M.R.** 1989. Mount Overlord, In W.E. LeMasurier and J.W. Thomson (eds.), Volcanoes of the Antarctic Plate and Southern Oceans. American Geophysical Union.

Conference Proceeding Papers

21. **Noll, M.R.**, Smith, Maj. M.H., Carter, C.H., Thomas, A., and Kerch, P.E. 1996 Development of a Facility for the Demonstration of Emerging DNAPL Remedial Technologies by Means of Contained Release Experiments. Proceedings, Third International Symposium and Exhibition on Environmental Contamination in Central and Eastern Europe. Warsaw, Poland.
22. Smith, Maj. M.H., and **Noll, M.R.** 1995. The Groundwater Remediation Field Laboratory: A Facility to Support Controlled Release Experiments. Proceedings of the Challenges and Innovations in the Management of Hazardous Waste, Air & Waste Management Association and Waste Policy Institute, May 10-12, Washington, D.C.
23. **Noll, M.R.** 1994. Use of Sequential Selective Extraction Methods for Metals Speciation and Remediation Technology Evaluation. In D. Wm. Tedder (ed.), American Chemical Society, Emerging Technologies In Hazardous Waste Management VI.
24. **Noll, M.R.**, Epps, D.E., Bartlett, C.L., and Chen, P.J. 1993. In Situ Pilot Field Applications of a Colloidal Silica Gel Technology for In-Situ Hot Spot Stabilization and Horizontal Grouting. National Ground Water Assoc. Seventh National Outdoor Action Conference Proceedings, Las Vegas.

25. **Noll, M.R.**, Bartlett, C.L., and Dochat, T.M. 1992. In Situ Permeability Reduction and Chemical Fixation Using Colloidal Silica. National Ground Water Assoc. Sixth National Outdoor Action Conference Proceedings, Las Vegas.
26. **Noll M.R.**, Sparks, D.L., and Bertsch, P.M. 1990. Mineralogical Factors Effecting the Mobility of ^{137}Cs in Terrestrial and Aquatic Environments. American Inst. of Hydrology - Leningrad Mining Inst., Proceedings, US/USSR Joint Conference on Global Environmental Hydrology and Hydrogeology, Leningrad.

Invited Conference Proceeding Paper

27. **Noll, M.R.** 1993. Innovations in Containment and Barrier Technology. Proceedings, Computational Initiative for the Oil and Gas Industry, Los Alamos National Laboratory. June 21-24, Santa Fe, NM.

Conference Abstracts

28. Hills, D.J., Madsen, J.A., McGeary, S., Black, J.D., and **Noll, M.R.** 1995. Using 100 Mhz Ground Penetrating Radar at the Dover Air Force Base Groundwater Remediation Field Laboratory. Geological Society of America Abstracts w/ Programs. V.28.
29. Kyle, P.R., Gamble, J.A., McIntosh, W.C., and **Noll, M.R.** 1982. McMurdo Volcanic Group, Northern Victoria Land, Antarctica, Antarctic Journal of the United States, 1982 Review. V.XVII, No.5.
30. Mirecki, J., **Noll, M.R.***, and Sparks, D.L. 1985. Sand Mineralogy of Delaware Coastal Plain Soils: Its Role in Supplying Potassium. Agronomy Abstracts, Chicago.
31. **Noll, M.R.**, Bertsch, P.M., and Sparks, D.L. 1986. A Comparison of Sequential Selective Dissolution Methods for the Analysis of ^{137}Cs mobility in Lake Sediments. Geol. Assoc. Canada Min Assoc. Canada Programs w/Abstracts. V.11, Ottawa.
32. **Noll, M.R.**, Bertsch, P.M., and Sparks, D.L. 1986. Kinetics of Cs-K and Cs-NH_4 Exchange on Kaolinite and Vermiculite. Agronomy Abstracts, New Orleans.
33. **Noll, M.R.**, Bertsch, P.M., and Sparks, D.L. 1987. The Effects of Temperature on the Sorption of Cesium by Illite. Clay Minerals Society Annual Meeting, Socorro, New Mexico.
34. **Noll, M.R.**, Cline, S.P., Baumel, M.H., and Darr, R.L. 1991. In-Situ Permeability Reduction and Chemical Fixation Using Colloidal Silica. Geological Society of America Abstracts w/ Programs. V.23 , No.5.
35. **Noll, M.R.**, and Kyle, P.R. 1985. Petrogenetic Modeling of Magma Evolution at Mount Overlord, Antarctica. Geological Society of America Abstracts w/Programs. V.17, No.1.
36. **Noll, M.R.** and Smith, Maj. M.H. 1995. Characterization of the U.S. Air Force Groundwater Remediation Field Laboratory: A Facility for the Contained Release of DNAPLs. Geological Society of America Abstracts w/ Programs. V.27, No.5.
37. **Noll, M.R.**, Smith, Maj. M.H., and Kerch, P.E. 1994. Development of an Experimental Controlled Release Site for the Evaluation of Environmental Remediation Technologies Under the DoD National Environmental Technology Demonstration Program. Geological Society of America Abstracts w/ Programs. V.26 , No.7.
38. **Noll M.R.**, Sparks, D.L., and Bertsch, P.M. 1985. Effects of Temperature on K-NH_4, K-Cs, and NH_4-Cs Exchange Selectivity on Selected Clay Minerals. Agronomy Abstracts, Chicago.
39. Sadusky, M.C., Sparks, D.L., and **Noll, M.R.** 1986. Mechanisms of Potassium Feldspar Weathering in Delaware Soils. Northeast Branch, American Society of Agronomy Abstracts, Newark, Delaware.

GRADUATE STUDENT COMMITTEES

Roger J. Ward
Daniel J. White
Hillary Richardson

HONORS, AWARDS, AND FELLOWSHIPS

- Special Recognition Award, USEPA Region III, 1996

- Rice University Consortium ECRS Advisory Committee, 1994.
- DuPont Chemicals R&D, Oscar Award for Achievement, 1992 and 1993.
- Distinguished Alumni Fellow, Millersville University, 1990.
- Outstanding Teaching Award, University of Delaware, 1987.
- Department of Energy NERP Fellowship-Savannah River Ecology Lab, June 1985 to December 1987.
- New Mexico Governor's Commission on Higher Education, 1984.
- Sigma Gamma Epsilon, National Earth Science Honor Society, May 1982.

PROFESSIONAL MEMBERSHIPS

Geological Society of America
Soil Science Society of America
National Association of Geoscience Teachers

Markus M. Hoffmann

CURRENT POSITION: Assistant Professor, Department of Chemistry, State University of New York at Brockport, Brockport, New York 14420 mhoffman@brockport.edu

EDUCATION

"Vordiplom"	1991, Chemistry, Darmstady University of Technology, Germany
M.A.	1996, Physical Chemistry, Washington University, St. Louis, MO
Ph.D.	1997, Physical Chemistry, Washington University, St. Louis,MO

PROFESSIONAL EXPERIENCE

1999-2000	Adjunct, Columbia Basin College, Department of Math and Science, Pasco, WA
1999-2000	Post Doctoral Associate, Pacific Northwest National Laboratory, Supercritical Fluids Groups, Richmond, WA
1994-1997	Graduate Assistant, Washington University, Department of Physics, St. Louis, MO
1993-1994	Teaching Assistant, Washington University, Department of Physics, St. Louis, MO
1992-1993	Teaching Assistant, Florida State University, Department of Chemistry, Tallahassee, FL

GRANTSMANSHIP

2003	Petroleum Research Fund Award from the American Chemical Society
2003	Workshop Project Associate Program Starter Grant for Team Learning
2000	Camille and Henry Dreyfus Faculty Start-up Grant for Undergraduate Institutes.
2001	Recipient of an educational grant from the Quadrille Ball of the Germanistic Society of America in 1995.

PUBLICATIONS

A Classroom Exercise Aiming at the Development of an Intuitive Understanding of P-V-T Phase Behavior of Fluids. Hoffmann, M.M. Journal of Chemical Education in press.

Measuring P-V-T Phase Behavior with a Variable Volume View Cell. Hoffmann, M.M., Salter, J.D. Journal of Chemical Education, in press.

Surfactants in Green Solvent Systems – Current and Possible Future Research Directions. Hoffmann, M.M., Heitz, M.P., Carr, J.B., Tubbs, J.D., Journal of Dispersion Science and Technology, 2003. Vol. 24:155-171.

Microwave-Assisted Synthesis of 1-Ethylk-3-Methylimidazolium Bromides. Woods, C.M., Bushie, N.T., Hoffmann, M.M. Journal of Undergraduate Chemistry Research, 2003. Vol. 2:1-4.

NMR investigation of High Pressure, High Temperature Chemistry and Fluid Dynamics. Yonker, C.R., Hoffmann, M.M. in "Supercritical Fluid Technology in Materials Science and Engineering: Synthesis, Properties and Applications", edited by Sun, Y.P., Marcel Dekker, Inc. March, 2002.

Ion Hydration and Ion-Pair Formation in Water. Fulton, J.L., Hoffmann, M.M., Darab, J.G., Palmer, B.J., Stern, E.A. APS Forefront, 2001. Vol. 1, pp. 83-85.

An Infrared and X-ray Absorption Study of the Structure and Equilibrium of Chromate, Dichromate and Dichromate in High Temperature Aqueous Solutions. Hoffmann, M.M., Darab, J.G., Fulton, J.L. Journal of Physical Chemistry. 2001. Vol. 105, pp. 6876-6885.

An Infrared and X-ray Absorption Study of the Equilibrium and Structure of the Chromate, Bichromate and Dichromate in Ambient Aqueous Solutions. Hoffmann, M.M., Darab, J.G., Fulton, J.L. Journal of Physical Chemistry A 2001, Vol. 105, pp. 172-1782.

Speciation of a Cu(1) Compound in a Heterogeneous Hydrothermal Mixture Using X-ray Imaging and X-ray Absorption Spectroscopy through a Diamond Micro-Reactor Cell. Fulton, J.L., Darab, J.G., Hoffmann, M.M. Review of Scientific Instruments, 2001. Vol. 72, pp. 2117.

An X-ray Absorption Fine Structure Study of Copper(1) Chloride Coordination Structure in Water up to 325 C. Fulton, J.L., Hoffmann, M.M., Darab, J.G. Chemical Physics Letters, 2000. Vol. 330, pp. 300-308.

Copper(1) and Copper(1) Coordination Structure under Hydrothermal Conditions at 325 C: An XAPS and MD Study. Fulton, J.L., Hoffmann, M.M., Darab, J.G., Palmer, B.J,. Stern, E.A. Journal of Physical Chemistry A, 2000. Vol. 104, pp. 11651-11663.

The Corrosion of Nickel Metal by High Temperature Aqueous Sodium Tungstate Solution Observed in situ by IR Spectroscopy. Hoffmann, M.M., Fulton, J.L. Corrosion Journal, 2000. Vol. 56, pp. 501-504.

A Short-Path Length, High Pressure Optical Flow Cell for Status and Time Resolved Infrared Spectroscopy, Suitable for Supercritical Fluid Solutions Including Hydrothermal Systems. Hoffmann, M.M., Addlemann, R.S., Fulton, J.L. Review of Scientific Instruments. 2000. Vol. 71, pp. 1552-1556.

XAFS Studies of Aqueous Tungstate and Chrome Solutions at High Temperatures and Pressures. Hoffmann, M.M., Darab, J.G., Fulton, J.L. A peer-reviewed paper in: Proceedings of the 13th International Conference on the Properties of Water and Steam. Eds. Tremaine, P.R., Hill, P.G., Irish, D.E., Balakrishnan, P.V. NRC Press, Ottawa, 2000. pp. 585-592.

A transition from a Six- to a Four-coordinate Ni Complex in High-Temperature Aqueous Solutions from X-ray Absorption Spectroscopy. Fulton, J.L., Darab, J.G, Hoffmann, M.M. accepted as a reviewed paper in: Proceedings of the 13th International Conference on the Properties of Water and Steam, Eds. Tremaine, P.R., Hill, P.G., Irish, D.E., Balakrishnan, P.V., NRC Press, Ottawa, 2000. pp. 593-598.

Unusual Dysprosium Ceramic Nano-Fiber Growth in a Supercritical Aqueous Solution. Hoffmann, M.M., Young, J.S., Fulton, J.L. Journal of Material Science, 2000. vol. 35, pp. 4177-4183.

New Experimental Developments for in situ XAFS Studies of Chemical Reactions under Hydrothermal Conditions. Hoffmann, M.M., Darab, J.G., Heald, S. M., Yonker, C.R., Fulton, J.L. Chemical Geology, 2000. Vol. 167, pp. 89-103.

A Transition in the Ni Structure from Six- to Four-Coordinate upon Formation of the Ion Pair Species in Supercritical Water: An XAFS, NIR, and MD Study. Hoffmann, M.M., Darab, J.G., Palmer, B.J,., Fulton, J.L. Journal of Physical Chemistry A, 1999. Vol. 103, pp. 8471-8482.

Studying in situ Hydrothermal Reactions with X-ray Absorption Spectroscopy. Hoffmann, M.M., Darab, J.G., Fulton, J.L., Stern, E.A. Mineralogical Magazine, 1998. Vol. 62-A, pp. 636-637.

Nuclear Magnetic Resonance Evidence of Disorder and Motion in Yttrium Trideuteride. Balbach, J.J., Conradi, M.S., Hoffmann, M.M., Udovic, T. J., Adolphi, N.L. Physical Review B, 1998. Vol. 58, pp. 14823-14832.

Hydrogen Exchange Reactions in Supercritical Media Monitored by in situ NMR. Hoffmann, M.M., Conradi, M.S. Journal of Supercritical Fluids, 1998. Vol. 14, pp. 31-40.

Are There Hydrogen Bonds in Supercritical Methanol and Ethanokl? Hoffmann, M.M., Conradi, M.S. Journal of Physical Chemistry B, 1998. Vol. 102, pp. 263-271.

Hydrogen Bonding and Exchange in Alcohols and Water. Hoffmann, M.M., Conradi, M.S. Symposium on General Papers, American Chemical Society, Division of Petroleum Chemistry, J. Reynold, Ed,: Las Vegas, NV, 1997. pp. 686-690.

Hydrogen Bonding in Supercritical Water, Methanol and Ethanol. Hoffmann, M.M., Conradi, M.S. Proceedings of the Fifth International Symposium on Hydrothermal Reactions, Palmer, A.P., Wesolowski, D.J., Ed; Gatlinburg, TN, 1997. pp. 176-180.

Are there Hydrogen Bonds in Supercritical Water? Hoffmann, M.M., Conradi, M.S. Journal of the American Chemical Society, 1997. Vol. 119. pp. 3811-3817.

Nuclear Magnetic Resonance Probe for Supercritical Water and Aqueous Solutions. Hoffmann, M.M., Conradi, M.S. Review of Scientific Instruments, 1997. Vol. 68, pp. 159-164.

CURRICULUM VITAE

David Allen Holtzman

Personal

Department of Psychology
135 Holmes Hall
SUNY Brockport
Brockport, NY 14420

Education and Positions Held

2001-Present	Assistant Professor Department of Psychology SUNY Brockport Brockport, NY
1997-2001	Assistant Professor Department of Brain & Cognitive Sci. University of Rochester Rochester, NY
1992-1997	Assistant Professor Neuroscience Program Oberlin College Oberlin, OH
1990-1992	Postdoctoral Fellow Laboratory of Neurobiology & Behavior The Rockefeller University New York, NY
1984-1990	Ph.D., Program in Neural and Behavioral Sciences State University of New York Health Science Center at Brooklyn Brooklyn, NY
1980-1984	B.S., Anatomy and Physiology Cornell University Ithaca, NY

Research Interests

Spatial ecology, memory, and learning in reptiles and amphibians
Development of sensory systems and their use in naturally-occurring behaviors
Chemical senses in reptiles and amphibians
Comparative neuroanatomy

Refereed Publications

Holtzman, D.A., Stosic, C.S., and J. Wyatt (In review) Movement of resident and displaced boa constrictors (Boa constrictor imperator) on Ometepe Island, Nicaragua. Herpetologica.

Holtzman, D.A., Stosic, C.S., and J. Wyatt (2002) Field use of a local anesthetic, lidocaine hydrochloride, for radiotransmitter implantation in *Boa constrictor imperator*. Herpetological Review 33:189-191.

Holtzman, D.A. (2001) Courtship behavior:*Thamnophis s. sirtalis*. Herpetological Review 32:110.

Stone, A., N.B. Ford, and D.A. Holtzman (2000) Spatial learning and shelter selection by juvenile spotted pythons, *Anteresia maculosus*. J. Herpetol. 34:575-587.

Holtzman, D.A., T.W. Harris, G. Aranguren and E. Bostock (1999) Spatial learning and memory of an escape task by young corn snakes. Animal Behaviour 57:51-60.

Holtzman, D.A. (1998) From slither to hither: Orientation and spatial learning in snakes. Integrative Biol. 1:81-89.

Holtzman, D.A. (1998) Cell dynamics in the embryonic and postnatal vomeronasal epithelium of snakes. Microscopy Research and Technique 41:471-482.

Holtzman, D.A., P.J. Brooks, D.W. Pfaff, and S. Schwartz-Giblin (1997) Preproenkephalin mRNA is regulated by an interaction between steroid hormones and noxious stimulation. J. Neuroendocrinol. 9:913-922

Stone, A. and D.A. Holtzman (1996) Feeding responses in young boa constrictors are mediated by the vomeronasal system. Anim. Behav. *52*:949-955.

Holtzman, D.A., E. Gordon, and M. Halpern (1993) Developmental changes in cytochrome oxidase histochemistry in the main and accessory olfactory bulbs of embryonic and neonatal garter snakes. J. Morphol. *218*:323-332.

Holtzman, D.A. (1993) The ontogeny of nasal chemosensory systems in garter snakes. Brain Behav. Evol. *41*:163-170.

Holtzman, D. A., D.W. Pfaff, and S. Schwartz-Giblin (1992) Axial muscle EMG responses evoked by cutaneous flank nerves in the female rat: effects of spinal transection, steroid hormones, and anesthesia. Brain Research *595*:39-49.

Holtzman, D.A. and M. Halpern (1991a) Incorporation of ^{3}H-thymidine in the embryonic vomeronasal and olfactory epithelia of garter snakes. J. Comp. Neurol. *304*:435-449.

Holtzman, D.A. and M. Halpern (1991b) Incorporation of ^{3}H-thymidine in telencephalic structures of the vomeronasal and olfactory systems of embryonic garter snakes. J. Comp. Neurol. *304*:450-466.

Holtzman, D.A. and M. Halpern (1990) Embryonic and neonatal development of the vomeronasal and olfactory systems in garter snakes (*Thamnophis* sp.). J. Morphol. *203*:123-140.

Holtzman, D.A., G.R. Ten Eyck, and D. Begun (1989) Artificial hibernation of garter (*Thamnophis* sp.) and corn (*Elaphe guttata guttata*) snakes. Herp. Review *20*:67-69.

Holtzman, D.A. and M. Halpern (1989) In vitro technique for studying garter snake (*Thamnophis* spp.) development. J. Exp. Zool. *250*:283-288.

Greenberg, L.A. and D.A. Holtzman (1987) Microhabitat utilization, feeding periodicity, home range and population size of the banded sculpin, *Cottus carolinae*. Copeia, *1987*:19-25.

Non-refereed Publications

Halpern, M. and D.A. Holtzman (editors, 1993) Preface to Chemosensing and chemosignaling in reptiles. Special issue of Brain, Behavior and Evolution, Vol. 41, Karger, Switzerland.

Holtzman, D.A. (1990) Embryonic and neonatal development of the vomeronasal and olfactory systems in garter snakes (*Thamnophis* spp.). Ph.D. Thesis. SUNY Health Science Center at Brooklyn.

Holtzman, D.A. and M. Halpern (1987) Development of olfactory and vomeronasal systems in the red-sided garter snake, *Thamnophis sirtalis parietalis*. In S.D. Roper and J. Atema (eds): Olfaction and Taste. Vol. 9. New York: New York Academy of Sciences, pp. 373-374.

External support

$195, 018 (direct costs) - NSF grant entitled, "Learning-dependent neurogenesis in snakes" (1999-2003).

$500 (direct costs) – East Texas Herpetological Society grant-in-aid (awarded with Ruston Hartdegen of the Dallas Zoo) entitled, “Sexual dimorphism in the hippocampus of varanid lizards (1999-2000).

$334,000 (direct costs) - NIH FIRST (R29) Award entitled, “Neurogenesis in the Olfactory and Vomeronasal Systems” (1994-1999)

$100,000 (direct costs) - NIH Shannon Award for expanding on ideas described in a R01 grant application entitled, “Neurogenesis in the Olfactory and Vomeronasal Systems” (1992-1994)

NIH Postdoctoral Fellowship: "Effects of steroids on axial muscle reflexes" (1990-1991); "Interactions of steroids and noxious stimulation on opiate expression in the ventromedial hypothalamus and spinal cord" (1992)

Honors and Awards

1999-2003	NSF Award – “Learning-Dependent Neurogenesis”
1994	W.M. Keck Foundation Fellowship in the Natural Sciences
1993	Excellence in Teaching Award from the Faculty for Undergraduate Neuroscience

1993-1998	NIH FIRST Award (R-29)
1992	NIH Shannon Award
1990-1992	NIH Postdoctoral Fellowships
1983	Cornell Tradition Summer Fellowship
1981-1984	Greene Scholarship
1980-1984	New York State Regents Scholarship

Research and Professional Experience

1992-Present	Independent research focusing on spatial learning and memory and embryonic and postnatal neurogenesis in the vomeronasal and olfactory systems and hippocampus; orientation behavior/spatial ecology in snakes
1990-1992	Postdoctoral research with Drs. S. Schwartz-Giblin and D.W. Pfaff at the Rockefeller University studying the interactions of steroid hormones with dorsal horn neurons of the spinal cord
1984-1990	Graduate study with Dr. Mimi Halpern at SUNY Health Science Center at Brooklyn examining the neuroanatomical development of the vomeronasal and olfactory systems in garter snakes
1983, 1984	Independent research at Cornell University studying the competitive interactions of two species of darters in an artificial stream
1983	Research assistant with L. Greenberg studying the interactions between various species of benthic stream fishes in the Little River, TN
1980-1984	Curatorial assistant in the Cornell Herpetological and Ichthyological Museum Collections

Teaching Experience

1999-Present	Ometepe, Nicaragua and La Suerte, Costa Rica Field Stations: Tropical Animal Behavior and Tropical Herpetology

1997-2001	Assistant Professor, Univ. of Rochester: Neuroethology, Introductory Neuroscience Lab and Lecture, Biomedical Research Ethics, Learning and Memory, Developmental Neurobiology
1992-1997	Assistant Professor, Oberlin College: Introductory Neuroscience Lab and Lecture, Developmental Neurobiology, and Animal Behavior
1990, 1991	Instructor, , Nassau County Community College: Human Anatomy and Physiology
1988, 1989	Lecturer, SUNY Health Science Center at Brooklyn: Medical Neuroscience
1986, 1987	Graduate Teaching Assistant, SUNY Health Science Center at Brooklyn: Medical Neuroanatomy
1983	Undergraduate Teaching Assistant, Cornell University: Comparative Vertebrate Anatomy

Scientific Organization Memberships

Cornell University Herpetological Society
International Brain Research Organization
Sigma Xi
Society for Neuroscience
Society for the Study of Reptiles and Amphibians

Journal and Professional Reviews

American Naturalist
Behavioral Neuroscience
Brain, Behavior and Evolution
Brain Research
Chemical Senses
Copeia
Herpetologica
Journal of Chemical Ecology
Journal of Comparative Neurology
Journal of Comparative Psychology
Journal of Herpetology

Study section for Small Grants for National Institute of Deafness and Communication Disorders
Ad hoc reviewer for National Science Foundation-Ecological and Evolutionary Physiology, Sensory Systems, and Developmental Neuroscience Programs

ENVIRONMENTAL SCIENCE AND BIOLOGY

List of periodical titles held by Drake Memorial Library, SUNY Brockport. Holdings were last updated in July, 2001. Items which are currently received in print or microform are indicated by an *. Titles which are available in an electronic version are indicated by the words --available online-- after the title.

- ……..AIBS bulletin v.1-13, 1951-1963 Cont by: BioScience
- AIBS education review v.1-7, 1972-1978 Conts: CUEBS news
- * Ambio v.11, 1982 (Mic-1); v.26, 1997-date
- * American bee journal v.120, 1980; v.122, 1982; v.124, 1984-date
- * American biology teacher v.18, 1956-date
- American fern journal v.1-66, 1910-1976
- American forests --available online-- v.46-90, 1940-1984; v.92-103, 1986-1998; v.105, 1999/00
- American midland naturalist --available online-- v.1-23, 1909-1940; v.37-45, 1947-1951; v.66, 1961; v.68-142, 1962-1999 (scattered issues missing)
- * American naturalist --available online-- v.94, 1960-date
- American scientist --available online-- v.30-33, 1942-1945; v.35-87, 1947-1999
- American zoologist --available online-- v.1-39, 1961-1999
- * Animal behaviour v.6, 1958-date, Conts: British journal of animal behaviour
- * Animal learning & behavior v.1, 1973-date
- Annals of botany v.10-52, 1946-1983 (scattered issues missing)
- * Annals of the Entomological Society of America v.1, 1908-date
- Annals of the Missouri Botanical Garden v.30-33, 1943-1946; v.35-70, 1948-1983 (scattered issues missing)
- Apicultural abstracts v.13-47, 1962-1996 (scattered issues missing)
- Apidologie v.20-26, 1989-1995
- * Applied & environmental microbiology --available online-- v.31-42, 1976-1981; v.62, 1996-date
- Aquacultural engineering --available online-- v.15-23, 1996-2000
- Aquaculture digest v.10-14, 1985-1989
- * Aquaculture magazine v.15, 1989-date (scattered issues missing)
- Arboretum & botanical garden bulletin v.2-7, 1968-1973 Cont by: Bulletin (American Association of Botanical Gardens & Arboreta)
- Archiv fur hydrobiologie v.57-92, 1960-1981 (scattered issues missing), Archiv fur hydrobiologie. Supplement-band v.38, 1972; v.40-62, 1972-1981; v.69, 1984 (scattered issues missing)
- Atlantic naturalist v.23-24, 1968-1969
- Audubon --available online-- v.43-101, 1941-1999
- * Auk --available online-- v.1-77, 1884-1960 (Mic-1); v.78-112, 1961-1995; v.116, 1999-date (scattered issues missing)
- Australian fisheries v.28-41, 1969-1982 (scattered issues missing), Conts: Australian fisheries newsletter
  Australian fisheries newsletter v.26-27, 1967-1968 Cont by: Australian fisheries
- Australian journal of marine & freshwater research v.11-36, 1960-1985 (scattered issues missing)
- * Bee culture v.121, 1993-date Conts: Gleanings in bee culture
- Bee world v.33-77, 1952-1996
- * Behavior genetics v.1, 1970- date
- * Behavioral ecology & sociobiology --available online-- v.1-2, 1976-1977; v.34, 1994-date
- * Behavioral neuroscience v.97, 1983-

- * Behaviour --available online-- v.20-23, 1963-1964; v.26, 1966-)
- * Biogeochemistry v.36, 1997-date
- Biological conservation --available online-- v.1-14, 1968- v.32-43, 1966-
- ……. Biometrics v.7-53, 1951-1997
- BioScience --available online-- v.14-49, 1964-1999 Conts: AIBS
- Bird-banding v.39, 1968; v.41-50, 1970-1979. Cont by: Journal of field ornithology
- Botanica marina v.12-17, 1969-1974
- Botanical gazette v.121-144, 1959-1983
- Botanical journal of the Linnean Society v.62-83, 1969-1981 Conts: Journal of the Linnean Society of London. Botany
- Botanical review --available online-- v.1-50, 1935-1984
- British journal of animal behaviour v.1-5, 1953-1957 Cont by: Animal
- Bulletin (American Association of Botanical Gardens & Arboreta) v.8-19, 1974-1985 (scattered issues missing) Conts: Arboretum & botanical garden bulletin. Cont by: Public
- Bulletin (Rochester Committee for Scientific Information) no.1-313, 1964-1992
- Bulletin of entomological research v.46-57, 1955-1968; v.59-74, 1969-1984
- Bulletin of environmental contamination & toxicology v.1-21, 1966-1979
- * Bulletin of marine science v.15, 1965-date Conts: Bulletin of marine science of the Gulf & Caribbean
  Bulletin of marine science of the Gulf & Caribbean v.10-14, 1960-1964 Cont by: Bulletin of marine science
- Bulletin of the Ecological Society of America v.49-71, 1968-1990 (scattered issues missing)
- Bulletin of the Entomological Society of America v.1-26, 1955-1980
- Bulletin of the International Oceanographic Foundation v.1-2, 1954-1956 (scattered issues missing) Cont by: Sea frontiers
- Bulletin of the Massachusetts Audubon Society v.32-37, 1948-1953; v.39-42, 1955-1958 (scattered issues missing)
- Bulletin of the Torrey Botanical Club v.73-123, 1946-1996 Cont by: Journal of the Torrey Botanical
- Canadian entomologist v.52, 1920; v.70-80, 1938-1948; v.83, 1951; v.90-116, 1958-1984
- * Canadian field naturalist v.65, 1951; v.79, 1965-date
- Canadian fish culturist no.32-40, 1964-1969
- Canadian journal of animal science v.48-54, 1968-1974
- Canadian journal of botany v.29-63, 1951-1985 Conts: Canadian journal of research. Section C: Botanical sciences
- * Canadian journal of fisheries & aquatic sciences --available online-- v.37, 1980-date (scattered issues missing) Conts: Journal of the Fisheries Research Board of Canada
- * Conservation biology v.8, 1994-date
- Conservation Foundation letter 1973-1974 Conts: CF letter
- Conservationist --available online-- v.13-49, 1958-1995 Conts: New York State conservationist. Cont by: New York State conservationist (1995)
- * Copeia 1913-date
- * Cornell focus v.3, 1994-date (scattered issues missing
- Curtis's botanical magazine v.175-183, 1967-
- EHP: Environmental health perspectives no.2-100, 1972-1993 Cont by: Environmental health perspectives, and Environmental health perspectives supplements
- * Ecological applications v.4-5, 1994-1995; v.7, 1997-date
- * Ecological monographs --available online-- v.1, 1931-date
- Ecology (Akademiia nauk SSSR) 1970 Cont by: Soviet journal of ecology
- * Ecology (Ecological Society of America) --available online-- v.1, 1920-date
- Ecology of western North America v.2, 1969/70

- * Environment --available online-- v.11, 1969-date (scattered issues missing
- Environment & behavior --available online-- v.1-31, 1969-1999
- ……Environment international v.2, 1979 (Mic-1); v.13-18, 1987-1992
- Environmental action v.7-16, 1976-1984 (scattered issues missing)
- * Environmental biology of fishes v.10, 1984-date
- Environmental education v.1, 1969/70 Cont by: Journal of environmental education Environmental education report v.3-12, 1975-1984
- * Environmental ethics v.1, 1979-date
- * Environmental health perspectives --available online-- v.101, 1993-date (scattered issues missing)
- * Environmental health perspectives supplements --available online-- v.101, 1993-date Conts in part: EHP: Environmental health perspectives
- * Environmental management --available online-- v.1-2, 1976-1978; v.9, 1985; v.11, 1987-date
- Environmental mutagenesis v.2-9, 1980-1987 (scattered issues missing)
- Environmental pollution v.1-20, 1970-1979 Cont in part by: Environmental pollution. Series A
- * Environmental pollution (1987) --available online-- v.95, 1997-date Conts: Environmental pollution. Series A
- * Environmental science & technology v.1, 1967-
- European journal of soil science v.45-51, 1994-2000, Conts: Journal of soil science
- * Evolution --available online-- v.1, 1947-
- Fish & wildlife news 1980-1993 (scattered issues missing)
- * Fisheries v.1, 1976-date
- * Fishery bulletin --available online-- v.74, 1976-date (scattered issues missing)
- Flora v.159-169, 1970-1980; v.171, 1981 Conts: Flora oder allgemeine botanische zeitung. Abt. B Flora oder allgemeine botanische zeitung. Abt. A: Physiologie und biochemie v.159-160, 1968-1969 Cont by: Biochemie und physiologie der pflanzen Flora oder allgemeine botanische zeitung. Abt. B: Morphologie und geobotanik v.157-158, 1967-1969 Cont by: Flora
- * Freshwater biology v.1, 1971-date
- * Great Lakes entomologist v.5, 1972-date Conts: Michigan entomologist
- Great Lakes news letter v.11-24, 1966-1984 Guide to nature v.1-4, 1908-1911 (scattered issues missing)
- Herpetological review 1967-
- Horticulture --available online-- v.44-62, 1966-1984
- HortScience v.4-19, 1969-1984 (scattered issues missing)
- * Hydrobiologia v.24, 1964-date (scattered issues missing)
- * Ibis v.110, 1968-
- International wildlife --available online-- v.1-30, 1971-2000
- Internationale revue der gesamten hydrobiologie v.56-59, 1971-1974
- * Invertebrate biology v.114, 1995-date Conts: Transactions of the American Microscopical
- Journal (American Water Works Association) v.84-88, 1992-1996
- Journal (Water Pollution Control Federation) v.32-61, 1960-1989 (scattered issues missing) Cont by: Research journal of the Water Pollution Control
- * Journal of animal ecology v.1, 1932-date
- * Journal of apicultural research v.1, 1962-date
- Journal of applied aquaculture v.4, 1994; v.6-10, 1996-2000
- * Journal of applied ecology v.1-5, 1964-1968; v.31, 1994-date
- Journal of applied phycology v.1-6, 1989-1994
- * Journal of aquatic animal health v.1, 1989-date
- Journal of arboriculture v.1-2, 1975-1976; v.5-10, 1979-1984
- * Journal of avian biology v.25, 1994-date
- * Journal of bacteriology --available online-- v.1, 1916-
- Journal of ecology --available online-- v.1-87, 1913-1999

- Journal of economic entomology v.1-93, 1908-
- Journal of environmental education --available online-- v.2-29, 1970-1998 Conts: Environmental education
- * Journal of experimental botany --available online-- v.1, 1950-date
- Journal of experimental zoology v.140-260, 1959-1991
- * Journal of field ornithology v.51, 1980-date Conts: Bird-banding
- * Journal of fish biology v.7, 1975-date
- Journal of forestry v.47-63, 1949-1965 (Mic-1); v.64-82, 1966-1984; v.88-91, 1990-1993 (scattered issues missing)
- * Journal of freshwater ecology v.2, 1983-date
- * Journal of Great Lakes research v.1, 1975-date
- Journal of herpetology v.1-19, 1968-
- Journal of insect pathology v.1-6, 1959-
- Journal of insect physiology --available online-- v.1-43, 1957-1997
- Journal of invertebrate pathology v.7-38, 1965-
- * Journal of mammalogy --available online-- v.21, 1940-date
- * Journal of molluscan studies --available online-- v.60, 1994-date
- * Journal of phycology v.1, 1965-date
- * Journal of soil & water conservation --available online-- v.22, 1967-date
- Journal of soil science v.17-44, 1966-1993
- * Journal of the American Water Resources Association v.33, 1997-date Conts: Water resources bulletin
- Journal of the Arnold Arboretum v.1-63, 1919-1982
- Journal of the Fisheries Research Board of Canada v.18-36, 1961-1979 Cont by: Canadian journal of fisheries & aquatic
- Journal of the Kansas Entomological Society v.41-47, 1968-1974
- Journal of the Marine Biological Association of the United Kingdom v.40-41, 1961; v.45-64, 1965-1984
- * Journal of the New York Entomological Society v.76, 1968-date
- * Journal of the Torrey Botanical Society v.124, 1997-date Conts: Bulletin of the Torrey Botanical
- * Journal of wildlife management v.15, 1951-
- * Limnology & oceanography v.1, 1956-date
- * Living museum v.16-21, 1954-1960; v.29, 1967-date
- Living wilderness v.19-45, 1954-1982 Cont by: Wilderness
- Marine biology v.1-28, 1967-1974
- Michigan entomologist v.1-4, 1966-1971
- National parks --available online-- v.55-71, 1981-1997 Conts: National parks & conservation magazine
- Natural history --available online-- v.54-108, 1945-1999
- Naturalist 1968-1985
- * Nature v.6, 1872; v.53-98, 1895-1916; v.151-152, 1943; v.155, 1945-date
- * Nature Canada v.1, 1972-date Nature magazine v.25-52, 1935-
- New York fish & game journal v.9-32, 1962-1985
- New York State conservationist v.3-14, 1948-1960
- * New York State conservationist (1995) --available online-- v.50, 1995-date
- * North American journal of aquaculture v.61, 1999-date Conts: Progressive fish-culturist
- * North American journal of fisheries management v.1, 1981-date
- Oceans v.17-22, 1984-1989
- * Oceanus --available online-- v.11, 1964-date (scattered issues missing)
- * Oecologia --available online-- v.1, 1968-date
- * Oikos v.16, 1965-date
- Phycologia v.3-24, 1963-1985 (scattered issues missing)
- * Proceedings of the National Academy of Sciences … --available online-- v.1-21, 1915-1935; v.23-26, 1937-1940; v.28, 1942-date

- * Proceedings of the Rochester Academy of Science v.1, 1889-
- Progressive fish-culturist v.41-60, 1979-1998 Cont by: North American journal of
- Research journal of the Water Pollution Control Federation v.61-63, 1989-1991 Conts in part: Journal (Water Pollution Control Federation). Cont by: Water environment research
- Russian journal of ecology v.24-31, 1993-2000 (scattered issues missing) Conts: Soviet journal of ecology
- * Science --available online-- v.1-22, 1883-1894; new ser., v.1-7, 1895-1898; v.13, 1901-date (scattered issues missing) Science (Washington, D.C.)
- * Scientific American --available online-- v.2-14, 1846-1859; new ser., v.1-93, 1859-1905 (Mic-55 LAC 31486-593); v.76, 1897-date
- Sea frontiers (1988) --available online-- v.34-42, 1988-
- Smithsonian --available online-- v.1-32, 1970-2001 (scattered issues missing)
- Snowy egret v.37-46, 1974-1983; v.48, 1985 (scattered issues missing)
- * Soil Science Society of America journal v.40-48, 1976-1984; v.62, 1998-date
- Soviet journal of ecology v.2-23, 1971-1992 Conts: Ecology (Akademiia nauk SSSR). Cont by: Russian journal of ecology
- * Transactions of the American Entomological Society (1890) v.94, 1968-date
- * Transactions of the American Fisheries Society v.1-75, 1872-1945 (Mic-1); v.75, 1945-date
- Transactions of the American Microscopical Society v.84-113, 1965-1994
- * Trends in ecology & evolution --available online-- v.9, 1994-date
- * Water environment research v.64, 1992-date Conts: Research journal of the Water Pollution Control Federation Water research --available online-- v.1-35, 1967-2001
- Water resources bulletin v.5-32, 1969-1996 Cont by: Journal of the American Water Resources Association
- * Water resources research v.1, 1965-date (scattered issues missing)
- Water spectrum v.1-15, 1969-1983
- Watsonia v.6-14, 1964-1983
- Wilderness --available online-- v.46-59, 1982-1995 (scattered issues missing)
- * Wildlife monographs no.4, 1960-date (scattered issues missing)
- * Wildlife Society bulletin v.1, 1973-date (scattered issues missing)
- Wilson bulletin (Wilson Ornithological Society) --available online-- v.33-35, 1921-1923; v.39-48, 1927-1936; v.52-66, 1940-1954; v.106-111, 1994-1999

EARTH SCIENCES

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- * AAPG bulletin v.58, 1974-date
- Acta crystallographica. Section A: Crystal physics, diffraction, theoretical & general crystallography v.25-30, 1969-1974
  Acta crystallographica. Section B: Structural crystallography & crystal chemistry v.25-30, 1969-1974
- Agricultural & forest meteorology --available online
- Agricultural meteorology v.1-30, 1964-
- American Association of Petroleum Geologists bulletin v.51-57, 1967-1973
- * American journal of science v.246, 1948-date
- American meteorological journal v.6-12, 1889-1896
- * American mineralogist v.1-27, 1916-1942 (Mic-1); v.26, 1941-date

- * American paleontologist v.4, 1996-date (scattered issues missing)
- Antarctic journal of the United States --available online-- v.19-32, 1984-1997)
- Antipode v.1-15, 1969-1983
- * Applied geochemistry --available online-- v.13, 1998-date
- Arctic & alpine research v.3-30, 1971-1998
- * Arctic, antarctic & alpine research v.31, 1999-
- * Atlantic geology v.25, 1989-date
- * Atmosphere-ocean --available online-- v.16, 1978-date
- Beitrage zur mineralogie und petrographie v.6-11, 1957-1965
- Conts: Heidelberger beitrage zur mineralogie und petrography
- Bulletin de la Societe Geologique de France ser. 7, v.10-16, 1968-1974
- * Limnology & oceanography v.1, 1956-date
- * Lithos --available online-- v.1, 1968-date
- Marine geology --available online-- v.1-114, 1964-1993
- Marine geophysical researches v.1-3, 1970-1978
- * Marine georesources & geotechnology --available online
- Maritime sediments v.1-16, 1965-1980
- Micropaleontology v.11, 1965; v.14-46, 1968-2000
- Mineral information service v.1-23, 1948-1970 Cont by: California geology
- Mineralium deposita v.1-32, 1966-1997 (scattered issues missing)
- * Mineralogical journal v.6, 1970-date (scattered issues missing)
- * Mineralogical magazine --available online--
- Mineralogical magazine & journal of the Mineralogical
- Minerals science & engineering v.1-8, 1969-1976 (scattered issues missing)
- Mines magazine v.59-87, 1969-1997
- Mining engineering v.21-49, 1969-1997
- Mining journal --available online
- Mining magazine --available online-- v.120-177, 1969-1997
- * Monthly weather review 1875-1876; 1878-1882: v.11-92, 1883-1964; v.94, 1966-date (scattered issues missing_
- * National weather digest v.8, 1983-date
- Nordic hydrology v.2-5, 1971-1974
- Norsk geologisk tidsskrift v.49-65, 1969-1985
- Northeastern environmental science v.1-3, 1982-1984
- Northeastern geology v.1-16, 1979-
- * Northeastern geology & environmental sciences v.17, 1995-
- Oceans v.17-22, 1984-1989
- * Oceanus --available online-- v.11, 1964-date (scattered issues missing)
- Oil & gas journal --available online-- v.67-97, 1969-1999
- Palaeogeography, palaeoclimatology, palaeoecology --available online
- * Palaeontology --available online-- v.12, 1969; v.16, 1973-date
- Palaios v.1-4, 1986-1989
- * Paleobiology v.8, 1982-date
- Physics & chemistry of minerals v.4-24, 1979-1997
- Precambrian research --available online-- v.1-7, 1974-1978
- Proceedings of the Geological Society of America
- Pure & applied geophysics v.122-127, 1984-1988
- Quarterly journal of the Geological Society of London v.124-126, 1968-1971
- Cont by: Journal of the Geological Society
- * Quarterly journal of the Royal Meteorological Society v.35, 1909-date
- Quarterly of the Colorado School of Mines v.60-72, 1965-1977
- Cont by: Colorado School of Mines quarterly
- * Quaternary research v.1, 1970-date
- Remote sensing of environment --available online-- v.1-26, 1969-1988
- Reviews of geophysics v.5-7, 1967-
- Reviews of geophysics & space physics v.8-21, 1970-

- Rocks & minerals --available online-- v.40-74, 1965-1999
- Sea frontiers v.3-31, 1957-1985
- * Sedimentary geology --available online-- v.1, 1967-date
- * Sedimentology v.1, 1962-date
- Skillings' mining review v.60-89, 1971-2000
- Soil science v.99-132, 1965-1981
- * Soil Science Society of America journal
- Soil Science Society of America proceedings v.34-39, 1970-
- Solar age v.4-11, 1979-1986 (scattered issues missing)
- Solar energy --available online-- v.1-41, 1957-1988
- Solar engineering & contracting v.1-4, 1982-
- Solar engineering magazine v.5-6, 1980-
- Solar law reporter v.1-3, 1979-1982
- * Southeastern geology v.5, 1963-date (scattered issues missing)
- Space science reviews v.1-94, 1962-2000
- Tectonophysics --available online-- v.1-121, 1964-1986
- Tellus v.22-34, 1970-1982 Cont by: its Series A, and Series B
- * Tellus. Series A: Dynamic meteorology & oceanography v.35, 1983-date
- * Tellus. Series B: Chemical & physical meteorology v.35, 1983-
- Transactions (American Geophysical Union) v.10-19, 1929-1938; v.23-49, 1942-1968 Cont by: Eos
- Tulane studies in geology v.1-6, 1962-1968 v.7-18, 1969-
- Water resources bulletin v.5-32, 1969-
- * Water resources research v.1, 1965-date (scattered issues missing)
- Water resources review 1967-1982 (scattered issues missing)
- Water spectrum v.1-15, 1969-1983
- * Weather v.1, 1946-date
- * Weather & forecasting v.3, 1988-date
- * Weatherwise --available online-- v.1, 1948-date
- Zeitschrift fur geomorphologie v.17-25, 1973-1981
- Zeitschrift fur geomorphologie. Supplementband no.19-40, 1974-1981

CHEMISTRY

List of periodical titles held by Drake Memorial Library, SUNY Brockport. Holdings were last updated in February, 2002. Items which are currently received are indicated by an *. Titles which are available in an electronic version are indicated by the words --available online-- after the title. Please check the library's web catalog or the list of electronic full text titles for access information. SUNY Brockport online catalog Full text electronic journal list *

- Accounts of chemical research v.1, 1968-date
- Analytica chimica acta --available online— v.29-428, 1963-2001; v.337, 1997-date (online)
- Analytical biochemistry v.1-215, 1960-1993
- * Analytical chemistry v.19, 1947-date Conts: Industrial & engineering chemistry. Analytical edition
- Angewandte chemie v.70-80, 1958-1968; v.83-86, 1971-1974
- * Applied spectroscopy --available online—
- Archives of biochemistry & biophysics v.109-212, 1965-1981
- Berichte der Deutschen Chemischen Gesellschaft v.1-77, 1868-1944
- Biochemical & biophysical research communications v.1-126, 1959-1985
- * Biochemical journal --available online-- v.74, 1960-date
- Biochemical medicine v.1-11, 1967-1974
- * Biochemical Society transactions v.1, 1973-date
- Biochemistry (Akademiia Nauk SSSR) v.38-39, 1973-1974
- * Biochemistry (American Chemical Society) v.1, 1962-date

- * Biochimica et biophysica acta --available online—
  v.37-972, 1960-1988 (scattered issues missing); 1997-date (online)
- Bulletin (Rochester Committee for Scientific Information)
  no.1-313, 1964-1992
  Bureau of Standards journal of research v.1-10, 1928-1933 (Mic-20)
- CRC critical reviews in analytical chemistry v.1-4, 1970-1975
- Canadian journal of chemistry v.29-69, 1951-1991 Conts: Canadian journal of research. Section B: Chemical sciences
- Canadian journal of research v.1-12, 1929-1935 Cont in part by: Canadian journal of research. Section B: Chemical sciences
- Canadian journal of research. Section B: Chemical sciences v.13-28, 1935-
  Conts in part: Canadian journal of research. Cont by: Canadian journal of chemistry
- * Chemical & engineering news v.28-34, 1950-1956; v.36, 1958-date
- Chemical communications 1965-1971 Cont by: Journal of the Chemical Society. Chemical communication
- * Chemical communications (1996) --available online-- 1996-
- * Chemical geology --available online, 1997-date (online)
- Chemical instrumentation v.3-5, 1971-1974
- * Chemical physics letters --available online-- v.264, 1997-date (online)
- * Chemical reviews v.1, 1924-date
- Chemical Society reviews v.1-20, 1972-1991
- Chemische berichte v.80-124, 1947-1991
- Chemistry v.37-51, 1964-1978 Cont by: SciQuest
- * Chemistry & biology -- available online-- v.6, 1999-date (online)
- Chemistry in Britain v.1-23, 1965-1987
- Comparative biochemistry & physiology v.1-37, 1960-1970
- * Comparative biochemistry & physiology. B: Biochemistry & molecular biology -- available online
- Discover --available online-- v.3-9, 1982-1988; v.10-19, 1989-1998 (Mic-1)
- Discussions of the Faraday Society no.1-52, 1947-
- Electroanalysis v.1-12, 1989-2000
- Electrochemical technology v.1-6, 1963-1968
- Environmental pollution v.1-20, 1970-
- * Environmental pollution (1987) --available online
- * Environmental science & technology v.1, 1967-date
- European journal of biochemistry --available online-- v.1-50, 1967-1975
- Faraday discussions of the Chemical Society no.53-90, 1972-
- Geochemistry international v.5-10, 1968-1973
- * Geochimica et cosmochimica acta --available online-- v.11, 1957-date
- Helvetica chimica acta v.44-68, 1961-1985
- I&EC product research & development v.1-7, 1962-
- Inorganic & nuclear chemistry letters v.1-17, 1965-
- * Inorganic chemistry v.1, 1962-date
- * Inorganica chimica acta --available online-- v.254, 1997-date (online)
- Journal of applied chemistry & biotechnology v.21-24, 1971-
- * Journal of biochemistry v.61, 1967-date (scattered issues missing)
- * Journal of biological chemistry --available online-- 1); v.168, 1947-date
- * Journal of chemical education --available online--
- * Journal of chemical physics --available online-- v.13, 1945-date
- Journal of chromatography --available online-- 1997-date (online)
- Journal of coordination chemistry v.9-14, 1979-1986
- Journal of electroanalytical chemistry v.1-12, 1959-
- * Journal of electroanalytical chemistry (1992) --available online--
- * Journal of histochemistry & cytochemistry --available online--
- Journal of inorganic & nuclear chemistry Cont by: Polyhedron

- Journal of molecular spectroscopy v.22-53, 1967-1974
- Journal of neurochemistry v.1-45, 1956-1985
- * Journal of organic chemistry v.1, 1936-date
- * Journal of organometallic chemistry -- v.527, 1997-date (online)
- Journal of physical chemistry v.1-100, 1896-1996
- * Journal of physical chemistry A v.101-102, 1997-1998; v.104, 2000-date
- * Journal of physical chemistry B v.101-102, 1997-1998; v.104, 2000-date
- Journal of research of the National Bureau of Standards. Section A: Physics & chemistry v.64-81, 1960-1977 Cont by: Journal of research of the National Bureau of Standards (1977)
- * Journal of research of the National Institute of Standards & Technology -- available online-- v.94-104, 1989-1999; v.100, 1995-date (online)
- * Journal of the American Chemical Society v.1, 1879-date
- Journal of the Chemical Society (1926) 1935-
- Journal of the Chemical Society. Faraday transactions 2 v.68-83, 1972-
- Journal of the Chemical Society. Perkin transactions 1 1972-1988
- Journal of the Electrochemical Society v.107-134, 1960-1987
- * Nature 1945-date
- New scientist --available online--
- * Phytochemistry --available online-- v.3-7, 1964-1968; v.9-20, 1969-1981; v.44, 1997-date (online)
- * Polyhedron --available online-- v.16, 1997-date (online)
  Proceedings of the American Chemical Society v.1-2, 1876-1878
- * Proceedings of the National Academy of Sciences --available online
- Product R & D v.8-13, 1969-1974 Conts: I&EC product research & development Quarterly reviews v.1-25, 1947-1971
- Record of chemical progress v.32, 1971
- * Review of scientific instruments --available online-- v.1, 1930-date
- * Science --available online-- v.1-22, 1883-1894; new ser., v.13, 1901-date
- Science news --available online-- v.89-154, 1966-1998 (Mic-1
  Science news letter v.42-79, 1942-1961; v.79-89, 1961-1966 (Mic-1
- * Scientific American --available online-- v.2-14, 1846-1859; new ser. v.1-93, 1859-1905 (Mic-55 LAC 31486-593); v.76, 1897-date
- Scientific monthly v.1-85, 1915-1957
- SciQuest v.52-55, 1979-1982 Conts: Chemistry
- Spectrochimica acta. Part A: Molecular spectroscopy --available online-- v.53,
- * Spectrochimica acta. Part A: Molecular & biomolecular spectroscopy --available online-- v.53, 1997-date (online) Conts: Spectrochimica acta. Part A: Molecular spectroscopy
- * Spectrochimica acta. Part B: Atomic spectroscopy --available online-- v.52, 1997-date (online)
- * Synthesis 1969-date
- * Tetrahedron --available online-- v.53, 1997-date (online)
- * Tetrahedron: Asymmetry --available online-- v.8, 1997-date (online)
- * Tetrahedron letters --available online-- v.1-41, 1959-2000; v.38, 1997-date (online)
- Transactions of the Faraday Society v.26-67, 1930-1971 Cont by: Journal of the Chemical Society. Faraday transactions 1, and 2
- * Trends in analytical chemistry: TrAC --available online-- v.1-4, 1981-1985; v.16, 1997-date (online)
- * Trends in biochemical sciences --available online-- v.16, 1991-date
- * Vibrational spectroscopy --available online-- v.1-9, 1990-1995; v.13, 1997-date (online)

ENV 614
Experimental Design

Fall 2003

Dr. Geoffrey Gardner
ggardner@brockport.edu

Hours: M W 5:30 – 7:00
Room: 218 Lennon

Office: Lennon 117
Phone: 395-5743

Office Hours: T-TH 11:30 – 12:30,Wed 12-1or by appointment

Required Text:
Zar, J.H. (1999). Biostatistical Analysis, 4th Edition., Prentice Hall.

Readings:
Hurlbert, S.H. 1984. Pseudoreplication and the design of ecological field experiments. Ecological Monographs 54(2):187-211.

Heffner, R.A., M.J. Butler, C.K. Reilly. 1996. Pseudoreplication revisited. Ecology 77(8): 2558-2562.

Calculator:
You will need a calculator for this class. On quizzes and exams you may NOT share calculators so it's important that every student has access to their own calculator.

Objective: This course provides the basic knowledge of introductory statistics. Students will learn the importance of statistics in biological research. They will be exposed to the underlying concepts of statistics as well as computations for various statistical tests.

Course Requirements:
Competence will be evaluated by 7 homework assignments, 4 quizzes, and 3 exams. All quizzes and exams will be a combination of multiple choice questions and short answer questions based on lectures and the text. Please bring two pencils with erasers and a calculator to each quiz and exam.

Homework assignments: Homework will be made up of problem sets assigned approximately every two weeks and will be collected. Each assignment will be worth 20 points for a total of 140 points. Problem set assignments will be collected at the beginning of the class on the day they are due. 1 point will be deducted for every day that an assignment is late. (For example, if due Monday and you hand it in Wednesday, 2 points will be deducted from that assignment). Assignments will not be accepted for a given week once that assignment has been graded and returned to the class. You will be assigned 7 problem sets over the course of the semester. It is in your best interest to do every homework.

While I encourage you to work in groups on homework assignments be aware that directly copying someone else's work will not help you learn the material. The purpose of homework assignments is for you to actively learn statistics through practice. This practice will be of value for quizzes and exams.

Quizzes: It is important in a statistics class to keep up with the material. Quizzes will be given periodically to ensure that everyone is understanding the material. Four quizzes will be given throughout the semester however, you may drop your lowest quiz grade. Each quiz will be worth 50 points for a total of 150 points. Make-up quizzes will NOT be given. You should take all 4 of the quizzes as this information will also be tested on the exams.

Exams: All exams will be comprehensive in nature. In a statistics course information builds on itself. What you learn earlier in the course will be needed to understand the material later in the course. Exams will be worth 100 points each for a total of 300 points. Tentative exam dates are noted on the syllabus. Make-up exams will only be given in cases where you can provide documentation for your absence.

Computer Lab: We will spend a portion of some class periods working in the Computer Lab. Three assignments will be collected and graded, each worth 10 points, for a total of 30 Computer Lab points.

Angel: Course materials and course information will be placed online. Students should enroll in the course to access materials. I will also place updated class announcements, reminders and review material on Angel.

Grading:
Final course grades will be determined as follows:

Quizzes	3 x 50 = 150 pts	
Exams and Final	3 x 100 = 300 pts	
Problem Sets	7 x 20 = 140 pts	
	Computer Lab	***3 x 10 = 30 pts***
Total	620 pts	

Final grades will be determined by adding the scores on your three highest quizzes, your three exam grades and problem set assignments. Final letter grades will be determined based upon the following scale:

A	93% and above	C	73 - 76%
A-	90 - 92%	C-	70 - 72%
B+	87 - 89%	D+	67 - 69%
B	83 - 86%	D	63 - 66%
B-	80 - 82%	D-	60 - 62%
		E	Below 60%

Attendance: Regular class attendance is expected and is the responsibility of each student. I will periodically take attendance in class. You will be responsible for all materials covered in class. If you miss class for some reason it is your responsibility to get the notes from another student in class. Lecture notes will not be available from the instructor.

Class Conduct and Punctuality: It is my goal to develop a relationship with students based on mutual respect and courtesy. To create an environment conducive to learning we all must exercise discipline and self-restraint. Behaviors that are disruptive and insulting to me or to other students in the class will not be tolerated. Examples of these behaviors include arriving

late to class, leaving class early, and talking during the lecture or any other actions that would be distracting to other students in the class.

Academic Integrity: SUNY Brockport has a firm policy concerning academic dishonesty. Please familiarize yourself with definitions and college policies regarding academic honesty in the College Student Handbook.

One final note: Statistics is generally thought of as a hard class. The key to this class is keeping up on the material, attending class and doing homework assignments. If you find that you are having a problem understanding the material or keeping up with the class do not hesitate in coming to talk to me.

Tentative Course Schedule

Date (week of)	**Topic**	**Reading**
8/25	Introduction - Measurements and Graphs	Ch 1, Ch 2
	9/1 - NO CLASS - Labor Day	
9/3	Measures of central tendency and variability	Ch 3-4
9/8 - 9/10	Probability - Computer Lab I (9/10)	Ch 5, 24.1
9/15* – 9/17	Standard scores, Normal Distribution, Distributions of Means	Ch 6 – 6.3
9/22 – 9/24	Hypothesis testing: Introduction - One- Sample test	Ch 6.4, Ch 7.0-7.2
Wen	**9/24 - EXAM 1 Chapters 1-6**	
9/29- 10/1	Research design - Confidence Intervals	Ch 7.3 – 7.5 Hurlbert, Heffner et al.
10/6 – 10/8*	Two Sample hypotheses: Independent groups t test	Ch 8.0 – 8.3, 8.5
	10/13 - NO CLASS – FALL BREAK	
10/15	Non- Parametric Test	Ch 8.9-8.10
10/20 - 10/22	Correlated groups t test - Computer Lab II (10/22)	Ch 9.0 – 9.5
10/27 – 10/29	Goodness of Fit	Ch 22.0-22.6
	10/29 - EXAM 2 Chapters 7-9	
11/3 – 11/5	One way between subjects ANOVA	Ch 10.0-10.1
11/10 – 11/12*	Nonparametric Test - Multiple comparisons	Ch 10.4, Ch 11.0 11.2 - 11.6
11/17 - 11/19	Two – Factor ANOVA, Repeated measures ANOVA	Ch 12.1-2.2,12.5
11/24 – 11/26	Computer Lab III (9/24)	
	11/26 - NO CLASS - Thanksgiving Break	
12/1* – 12/3	Regression - Correlation	Ch 17.1 – 17.3,

TO BE ANNOUNCED ** FINAL EXAM **

QUIZ DATES
Monday 9/15 Quiz 1

Wednesday 9/25: EXAM 1 Chapters 1-6

Wednesday 10/8: Quiz 2

Wednesday 10/29: EXAM 2 Chapters 7-9

Monday 11/12: Quiz 3

Monday 12/1: Quiz 4

BIO 621
Water Chemistry
Instructor: J. Makarewicz, 125 Lennon Hall

SPRING 2004

READING LIST: Articles are available on the World Wide Web. Titles of reading are in **bold.** To access the reading you will need to have Acrobat installed on your computer and have capability to reach the World Wide Web. Our password will be "mercury". Acrobat is available "free of charge' at Http://www.Adobe.com/proindx/acrobat/readstep.htm

Optional TEXT: Standard Methods for the Examination of Water and Wastewater**, 20th Edition**

SM = Standard Methods HO= Handout UN= Unknown RC= Regression Curve, QC= Quality Control

WEEK OF	LECTURE	READING
1/28	**Background**, Lab Orientation	SM:1-25 to 56, HO (Background 1,2,3,4)
2/4	**Background**, Safety in the LAB, Standards	HO, UN
2/11	**pH, Alkalinity, and Conductivity**……	…SM: 2-26 to 2-29,2-44 to2-47,4-86 to 4-91
2/18	**Sulfate** (Turbidimetric)	SM: 4-176 to 4-181, UN, RC
2/25	**Nitrate** (Cadmium Column) (Wash)	SM: 4-114 to 4-122, UN, RC
3/3	**Nitrate** (Cadmium-automated)	SM: 4-114 to 4-122, HO, UN, RC
3/10	**EXAM**	
3/17	VACATION WEEK	
3/24	**Phosphate** (Ascorbic-automated)	SM:4-139 to 4-153, HO, UN, RC
3/31	**Metal**s **and Introduction to Procedures** (Na - Atomic Absorption)	SM:1-1 to 1-24; 3-1 to 3-6; 3-13 to 3-18 780, Video # QD96.A8 A76 1992
4/7	**Calcium and Sodium**	"A.A. Book", Video, HO, UN, RC, QC, Video#
4/14	Lead (Graphite Furnace)	SM: 3-24 to 3-31, HO, UN, RC, Video #875
4/21	**Pesticide**s (Gas Chromatography)	SM:6-1 to 6-7, 6-91 to 6-104, HO, Video #3439
4/28	**Organochlorine Pesticides**	(Extraction FiltersHO, Filmstrip
5/5	Review	
5/14	**FINALS WEEK**	

WATER QUALITY ANALYSIS SPRING, 2004

EXAMS: Two Exams - 26 March 2004, Final on assigned day

QUIZZES: Several (unannouced)

UNKNOWNS: Many! Students are to work on their own. Each student is responsible for knowing how to operate the equipment. For each unknown, you will have to provide a regression curve, the correlation coefficient and a short paragraph. Each week this paragraph will address a question about the quality of the water in your unknown.

PAPERS: NONE

MAKE-UP POLICY:

There will be no make-up exams or quizzes. Unknowns are due by 2:30 PM the day they are assigned. After 2:30 PM, 10 points per day will be deducted for lateness.

ATTENDANCE: **The college policy states that you must attend all classes.** If you have any special needs or requirements, please see me after class.

GRADING:		
	Two Exams	60%
	Unknowns	30%
	Quizzes	10%
	Total	100%

Optional TEXT: Standards Methods for Examination of Water and Wastewater, 20th edition

LABORATORY RULES:

1. No smoking ever!
2. The Laboratory will be open during the (8:30 AM to 5 PM) for your use. Please keep in mind that the lab. will close promptly at 5PM. Enter this factor into your planning.
3. Keep the laboratory clean. Other people doing research use this laboratory continuously.
4. **Safety classes and lab coats must be worn in the lab at all times.**
5. Answers to unknowns will be due the following laboratory.
6. Report on broken equipment to Dr. Makarewicz immediately. Excessive and continuous damage to equipment by one student will be charged to the student. **A GRADE WILL NOT BE GIVEN UNTIL BROKAGE FEES HAVE BEEN PAID**.
7. Each student will have a mutually agreeable time slot to perform the laboratory. These times are from 8:30 AM to 12:30 and 12:30 PM to 4:30PM.

BIOL 406/506 – WILDLIFE ECOLOGY – FALL 2002

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites: Introductory Biology, Ecology (ENV 303)

Instructor: Dr. Chris Norment
Office: 119 Lennon
Office hours: T R 2:55-3:55 p.m., F 9:00-11:00 a.m., or by Appt.
Phone: 395-5748 (office)
637-0252 (home; **before 9:00 p.m**.)
E-Mail: cnorment@brockport.edu

General Course Objectives:

1. Introduce basic concepts of wildlife ecology.
2. Develop an understanding of the basic principles necessary to successfully manage wildlife populations.
3. Develop the ability to think critically about issues related to the ecology and management of wildlife populations.
4. To improve students' written and spoken communication skills.

Class Meets: T R 9:45-11:15 a.m., B0006 Holmes; F 1:15-5:15.

Texts: Bolen, E. G. and W. L. Robinson. 2003. Wildlife ecology and management. Fifth edition. Prentice Hall, Upper Saddle River, NJ.
Nelson, R. 1997. Heart and Blood: Living with deer in North America. Vintage Books, New York, NY.
A **large** three-ring binder also will be valuable.

Course Structure: The course format will include lectures, discussions, cooperative learning exercises, laboratory and field work.

Grading: Grades will be assigned based upon the following scheme:

Lecture tests - 2 at 100 points each	200
Final exam - 1 at 125 points	125
Papers	150
Problem sets and other written assignments	150
Quizzes	60
Total points	685(approximate)

(GRADUATE STUDENTS (BIO 506): Graduate students are expected to develop a deeper and broader understanding of wildlife ecology than is the case for undergraduates enrolled in ENV 406. Requirements for BIO 506 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. During the term I will take attendance; if you are not present and do not have a valid excuse (doctor's note, etc.), 7 points (about 1% of your grade) will be deducted from your point total. If you miss a scheduled lab without a valid excuse, 3% of the total points will be deducted. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes f**rom a classmate**. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to drop the course is September 24. Withdrawal policies are described in *Your Right to Know & Academic Policies Handbook*. **Unless prior arrangements have been made, late work will be discounted at the rate of 5%/school day**. Tests will be based primarily on material discussed during lectures and study group

sessions. **However**, approximately 10% of the points on each test may be based on material covered in your text, but not in class.

Surviving BIOL 427/527:

1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3.. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after the lecture.
6. "Don't worry, be happy." (Mehr Babba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-11, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, "*Your Right to Know & Academic Policies Handbook, 2000-2001*". The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class, or in a previous class. (In order to account for this last, unfortunate possibility, I keep a random subset of major papers from previous classes on file.) A wise policy might be to discuss freely, but write with complete independence. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment or the course**. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 506. In addition to the requirements for ENV 406, graduate students in BIO 506 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a habitat management plan for either a wetland or upland habitat at Iroquois National Wildlife Refuge. The habitat management plan will include recommendations for management based o previous experiences at the refuge and relevant literature.
3. Complete additional technical readings from the following source:
Journal of Wildlife Management: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings.)

SCHEDULE

Date	Topic	Readings*
Week 1		
Aug 27	Introduction	Chapters 1,2 *Er*: *Educational needs*
Aug 29	Some successes in wildlife mgmt	Chapter 3
Aug 30	No lab (I'll make it up to you later!)	

Week 2		
Sept 3	Guest lecture: History of attitudes towards nature (Ralph Black, English Dept.)	Handouts **JWM assignment due**
Sept 5	An overview of management issues **Quiz**: *Heart and Blood*, Chapter 1	
Sept 6	Field trip: Irondequoit	*Er*: Selecting deer management options
Week 3		
Sept 10	Field work: set mammal traps	
Sept 12	Field work: telemetry	
Sept 13	Discussion: Irondequoit deer mgmt Computer lab: Spreadsheets	Spreadsheet hints and Tips (do on your own)
Week 4		
Sept 17	Population ecology I	Chap 5 (pp. 48-57)
Sept 19	Population ecology II **Quiz: NY game species**	Chap 5 (pp. 57-69)
Sept 20	Lab: Soils (w/Earth Science class)	Chap 12
Week 5		
Sept 24	Census techniques	Review pp. 61-65
Sept 26	Movements	Chapter 6 (pp. 74-77, 81-91)
Sept 27	Lab: white-footed mouse data analysis	**Soils lab write-up due**
Week 6		
Oct 1	Food and cover	Chapter 7
Oct 3	**Test 1** (covers material from August 27-Oct1)	
Oct 4	Field trip: Iroquois NWR, Oak Orchard and Tonawanda WMAs	
Week 7		
Oct 8	Habitat management: grasslands	Chaps 13-14 (pp. 265-270, 298-313)
Oct 10	Habitat management: forests	Chapter 15
Oct 11	Computer lab: population estimation Discussion: Iroquois field trip	**Iroquois assignment due**
Week 8		
Oct 15	NO CLASS!	
Oct 17	Wildlife diseases	Chapter 8
Oct 18	Computer lab: geometric population models	**Wfm assignment due**

SCHEDULE

Date	Topic	Readings*
Week 9		
Oct 22	Exotic species	Chapter 18 pp. 321-322, 521

Oct 24	Hunting and trapping, animal rights	Chapter 10 (pp. 178-183) **Extension quest due**
Oct 25	Computer lab: logistic population models Discussion: exotic species/hunting; *Heart and Blood*	

Week 10

Oct 29	Predators	Chapter 9
Oct 31	Harvesting effects	pp. 183-192
Nov 1	Computer lab: harvest models	

Week 11

Nov 5	Nongame issues	Chapter 19
Nov 7	Lab: deer dentition	**Harvest model questions due**
Nov 8	Computer lab: life tables *Introduction: wolves and ungulates*	

Week 12

Nov 12	**Test 2** (covers material from Oct 4-Nov 8)	
Nov 14	Conservation Biology	Chapter 21 *Er*: Conservation biology trailblazers
Nov 15	Population analysis problem: wolves and ungulates	*er*: 6 papers

Week 13

Nov 19	Case study: caribou	*er*: Watchful world
Nov 21	HEP/HSI	
Nov 22	Lab: HEP/HSI	

Week 14

Nov 26	Economics	Chapter 20
Nov 28	NO CLASS	

Week 15

Dec 3	Wildlife and the public	Chapter 22
Dec 5	Wrap-up: discussion	**Irondequoit deer paper due**

Week 16

Thursday, Dec 10 (8:00 – 10:00) **Final exam** (Includes *H& B*)

*Unless otherwise noted, all readings refer to those in Bolen and Robinson.
Note: I assume that students in BIO 406/506 are familiar with the basic concepts in Chapter 4 (Ecosystems and Natural Communities).

Note: (Instructions for graduate students are indicated in parentheses)

ENV BIO 419/519 **Limnology** **FALL 2003**

Prerequisite – ENV 303 (Ecology), CHM 205, 206 (College Chemistry preferred)

Dr. Makarewicz 395-5747 Room 125 Lennon

E-Mail Jmakarew@brockport.edu

Recommended Text: - See attached reading list

Date	Lecture (Tentative)
Aug. 26	Properties of Water, The Late Great Lakes
Sep. 2	Origins of Lake Basins
Sep. 9	Solar Radiation
Sep. 16	Water Currents
Sep. 23	Carbonate cycle, Acid ppt., Acid Precipitation
Sep. 30	**Exam 1**
Oct. 7	Dissolved oxygen, Primary production
Oct. 14	No Class: Mid-semester break
Oct. 21	Phytoplankton **"TERM PAPER DUE"** Limiting Nutrient Controversy
Oct. 28	Zooplankton/Top-down vs Bottom-up, Zebra Mussels, Lake Ontario Ecosystem Structure
Nov. 4	**Exam 2**, Lotic Environment
Nov. 11	Stressed Stream Analysis,
Nov. 18	Effects of Clear Cutting
Nov. 25	**Thanksgving recess begins at 10 PM** Palaeolimnology
Dec. 2	*Wetlands System, Lake Ontogeny*
Dec. 9	Final Exam: 6 to 8pm

Graduate Students (ENV 519): A deeper and broader understanding of Limnology is expected of graduate students; that is, the expectation level for graduate students are significantly different from undergraduates. These include an extra term paper, extra readings and more rigorous grading of exams. Items in parentheses represent graduate student requirements.

Attendance Policy: The college policy allows excused absences for documented illnesses, official representation of the college, death of a close relative, religious holiday and other circumstances beyond the control of the student. Students whose unexcused absences exceed 15% of the scheduled classes and laboratories may receive a lowered grade or failure at the instructor's discretion.

Make-up Policy - There are no make-ups for exams.

Term Paper - Ten points will be deducted for each day the paper is late. (Graduate students will complete two term papers). All students will do a critical review of a paper from the Journal of Great Lakes Research. The second graduate student term paper will focus on some aspect of your research.

Disability - If anyone has a special need due to a disability, please see me after class.

Grading -

	UG	Grad
Exam 1	= 25%	(20%)
Exam 2	= 25%	(20%)

Final = 30% (20%)
Term Paper = 20% (40%)

Drop Policy: You may drop up to 1 December with no penalty. After this, date you need the permission of the department chairperson. Withdrawals are given only for illness or unusual circumstances.

READING LIST: Journal articles are available on the World Wide Web. To access the reading you will need to have Acrobat installed on your computer and have capability to reach the world Wide web. Acrobat is availble "free of charge' at Http://www.Adobe.com/proindx/acrobat/readstep.htm

Undergraduates: Chapter numbers in the first column refer to Wetzel's "Limnology: Lake and River Ecosystems. "THIRD EDITION". This is not required for undergraduates! Recommended only !!

Graduates: Chapter's listed in the third column are from either Mackie's Applied Aquatic Ecosystem Concepts ("Second Edition) or Wetzel's Limnology. **(**Extra graduate student readings are in parentheses!!!!,)

Week of	Author	***Title***	Journal
26 Aug. Chap. 2 & 3	Frieses, G.T. (1995) Frieses G.T. (1996)	Part 1. E.A. Birge and C. Juday: A biography and their contributions to limnology Part 2. E.A. Birge and C. Juday: A biography and their contributions to limnology	LakeLine- 16(1):16 LakeLine- 16(2):22
2 Sept. Chap. 4, 5 & 6	Powers, C.F. and A. Robertson.(1966)	The Aging Great Lakes (Chapter 5, Fate of Heat)	Scientific American. 215(5): 95-103. (Wetzel's Limnology)
9 Sept. Chap. 7	Korgen, B.J. (1995)	Seiches (Chapter 7, Water Movements))	American Scientist. 83:330. (Wetzel's Limnology)
16 Sept Chap. 9, 10, 11 .	Likens, G. et al. (1979)	Acid Rain	Scientific American. 241(40): 43.
23 Sept	Zurawell (2001)	Cyanobacteria: A review	LakeLine – 20:29
30 Sep Chap 12, 13, 14.	McCauley, R. (1997)	Adventures of a forensic limnologist (Chapter 13, Phosphorus Cycle)	LakeLine - 17(4): 16 (Wetzel's Limnology)
7 Oct.	Armand, A. (1995)	Algae - Nature's Artwork.	LakeLine - 15(3):10
14 Oct. Chap. 15, 16	McNabb, C. (1993) Carpenter, S.R. et	Zooplankton in lakes Cascading trophic interactions and	LakeLine - 15(3):18 Bioscience - 35(10):

	al. (1985)	lake productivity	634.
21 Oct. Chap. 8	Beaver, J. (1995)	Zebra Mussels	LakeLine - 13(2):22
28 Oct.	Osgood, D. (1996)	The ecological basis for lake and reservoir management (Chapter 12, Water Quality Asessment)	LakeLine - 16(2): 18 (Mackie's Applied Aquatic Ecosystem)
4 Nov.	Makarewicz, J.C. (1991) Spencer et al. (1991)	Evidence for the restoration of the Lake Erie ecosystem Shrimp Stocking, Salmon Collapse, and Eagle Displacement	BioScience -40:216 Bioscience 41:14
11 Nov.	Bormann, F.H. et al. (1968) Makarewicz, J.C. (1993) Williams, V. (1994)	Nutrient loss accelerated by clear-cutting of a forest ecosystem Stressed stream analysis What's a lake worth	Science - 159:882 Waterworks - Spring : 1 LakeLine - 14(2):37
18 Nov.	Stow, C. A. , et al. (1995) Smith, S.H.	Fisheries management to reduce contaminant consumption Early changes in the fish community of Lake Ontario	BioScience - 54(11):752 Great Lakes Fishery Commision. Tech. Rep. 60
25 Nov Chap. 24 c.	Ney, J.J. (1993) Kaufman, M.M. (1995)	Top-down management of water quality Improving nonpoint pollution control efforts in urban watersheds (Chapter 13, Water Pollution and Control…)	LakeLine - 13(4):16 LakeLine - 15(2):22 (Mackie's Applied Aquatic Ecosystem)
2 Dec. Chap. 25	Kusler, J.A. et al. (1994)	Wetlands	Scientific American. ? :64

Environmental Science 422/522
Population Biology
(Prerequisite: Ecology, ENV 303)
Note: (Instructions for graduate students are indicated in parentheses)

Spring 2004

Hours: Tuesday, Thursday 5:30 – 7:00
Room: 136 Lennon

Dr. Geoffrey Gardner
ggardner@brockport.edu
Office: Lennon 117
Phone: 395-5743
Office Hours: M + T 11:30-12:30 or

by appointment

Required Text:
Begon, Mortimer, and Thompson (1996). Population Ecology, 3rd Edition., Blackwell Science. (BMT)

Supplemental articles will be available on ANGLE.

Calculator:
You will need a calculator for this class. On exams you may NOT share calculators so it's important that every student has access to their own calculator.

Objective: This course considers the evolution and function of populations. It combines population genetics with population ecology.

Course Requirements:
Competence will be evaluated by homework assignments and exams. All exams will be a combination of multiple choice questions and short answer questions based on lectures, the text and readings. A topic paper will also be required.

(Graduate Students (ENV 522): Graduate students will be expected to have a broader and deeper understanding of Population Biology, therefore, the expectation level for graduate students are significantly higher than for undergraduates. Graduate students will be expected to complete an extensive research paper and are subject to a more rigorous grading of problem sets and exams. In addition, graduate students will be responsible for leading class discussions on current topics in population biology.)

Homework assignments: Homework will be made up of problem sets. Each assignment will be worth 50 points for a total of 150 points. Problem set assignments will be collected at the beginning of the class on the day they are due. 1 point will be deducted for every day that an assignment is late. (For example, if due Tuesday and you hand it in Thursday, 2 points will be deducted from that assignment). Assignments will not be accepted for a given week once that assignment has been graded and returned to the class. You will be assigned 3 problem sets over the course of the semester.

While I encourage you to work in groups on homework assignments, be aware that directly copying someone else's work will not help you learn the material. The purpose of homework assignments is for you to actively learn through practice. This practice will be of value for exams.

Exams: Exams will be worth 100 points each for a total of 300 points. Tentative exam dates are noted on the syllabus. Make-up exams will only be given in cases where you can provide documentation for your absence.

Paper: This will be a term paper reviewing research on one particular topic of population biology, using reference material and primary literature. Choose a topic early in the semester. The topic is your choice, and this is a solo project. A topic must be submitted by the scheduled deadline. The format will be as follows:

- 5-10 pages, double-spaced, including references**. (Graduate students papers should be 10-15 pages).**
- begin with a title, your name, course number and date
- pages must be numbered
- use subheadings to organize your writing
- state the underlying scientific question clearly, and describe how it arose.
- describe research methods used to probe the question, and their results.
- draw your own conclusions, and suggest further research.
- use the Latin binomial to introduce a species. Common names can be used thereafter.
- minimum of 10 references, **primary scientific papers**.
- cite last names of authors and dates in parentheses; don't use numbers or footnotes.
- for the bibliography, list references in same format as in your textbook.
- do not use direct quotations; use your own words
- grammar and spelling will be checked.

Participation

You are expected to attend every class. Periodically we will have class discussions on various papers/topics/issues**. (Graduate students will be assigned to a date to lead a discussion on a current issue in population biology. Graduate students will select the paper for the topic, which will be assigned to the class. A written review of the paper is also expected)**

Angel: Course materials and course information will be placed online. Students should enroll in the course to access materials. I will also place updated class announcements, reminders and review material on Angel.

Grading:

Final course grades will be determined as follows:

Exams and Final	3 x 100 = 300 pts	
Problem Sets	3 x 50 = 150 pts	
Paper		***= 100 pts***
		(Paper review [graduate only] = 25pts)
Total	550 pts (575 pts)	

Final grades will be determined by adding the scores on your three exam grades, problem set assignments and paper.

Attendance: Regular class attendance is expected and is the responsibility of each student. I will periodically take attendance in class. You will be responsible for all materials covered in class. If you miss class for some reason it is your responsibility to get the notes from another student in class. Lecture notes will not be available from the instructor.

Class Conduct and Punctuality: It is my goal to develop a relationship with students based on mutual respect and courtesy. To create an environment conducive to learning we all must exercise discipline and self-restraint. Behaviors that are disruptive and insulting to me or to other students in the class will not be tolerated. Examples of these behaviors include arriving late to class, leaving class early, and talking during the lecture or any other actions that would be distracting to other students in the class.

Academic Integrity: SUNY Brockport has a firm policy concerning academic dishonesty. Please familiarize yourself with definitions and college policies regarding academic honesty in the College Student Handbook.

Tentative Course Schedule

Date (week of)	**Topic**	**Reading**
1/27 – 1/29	Introduction - Species Concept	Birch Davis, Hay
2/3 – 2/5	Geographical Variation and Speciation	Lack, Grant Brown,
2/10 - 2/12	Genetic Variability, Hardy Weinberg law	Bishop and Cook,
2/17 – 2/19	Population Genetics	King and Lawson Elena et al
2/24 – 2/26	Genetics con't	
Thurs	**2/26 - EXAM 1**	
3/2- 3/4	Estimating population density, Distribution of Species population	Mills
3/9 – 3/11	Life Tables	BMT Ch 1 Luckinbill Reznick Topics due
	3/16 – 3/18 - NO CLASS – SPRING BREAK	
3/23 – 3/25	Models of population Growth	BMT ch 3
3/30 – 4/1	Competition	Brown and Davidson BMT ch 4
4/6 – 4/8	Competition cont	Goldberg and Barton
	4/8 - EXAM 2	
4/13 – 4/15	Population Cycles - Predation	Korpimaki and Krebs BMT ch 5
4/20 – 4/22	Parasites and Parasitoids and Disease	BMT ch 5
4/27 - 4/29	Population Regulation	BMT ch 6 Murdoch

5/4 – 5/6 Species Diversity Pimm
Hughes
Grassle

TO BE ANNOUNCED ** FINAL EXAM - 3 **

Additional Readings. – you will need Acrobat installed to view articles. These should be available on Angel. Some are available through library e-reserves in addition.

Birch, L.C. 1960. The genetic factor in population ecology. American Naturalist. 94:5-24.

Davis, J.I. 1996. Phylogenetics, Molecular Variation and Species Concepts. BioScience 46 (7) 502-511

Hay, J. 2001. The Mind of the species problem. Trends in Ecology and Evolution. 16(7): 326-329.

Mayr, E. 1969. The Species problem In Evolution: A book of Readings. Brosseau, G.E. ed.

Lack, D. 1953. Darwin's Finches. Scientific American

Grant, B.R. and P.R. Grant. 1989. Natural Selection in a Population of Darwin's Finches. American Naturalist. 133: 377-393.

Brown, J.H. 1971. The Desert Pupfish. Scientific American 225:104-110

Bishop and Cook 1975 Moths, melanism and clean air. Scientific American 231(1) 90-99

King and Lawson. 1997. Microevolution in Island Water Snakes. BioScience 47 (5): 279-286

Elena, S.F., V.S. Cooper, and R.E. Lenski. 1996. Punctuated Evolution caused by selection of rare and beneficial mutations. Science 272: 1802-1804.

Mills, L.S., M.E. Soule, and D.F. Doak. 1993. The Keystone- Species Concept in Ecology and Conservation. BioScience. 43(4): 219- 224.

Deevey, E.S. 1950. The Probability of Death. Scientific American. 18: 58-60.

Luckinbill, L.S. 1988. r and K selection in experimental populations of *Escherichia coli.* Science 202: 1201- 1203.

Reznick, D., M.J. Bryant, and F. Bashey 2002. r and K selection revisited. Ecology 83(6): 1509-1520.

Brown, J.H. and D.W. Davidson. 1977. Competition between seed-eating rodents and ants in desert ecosystems. Science 196 880 -882

Goldberg, D.E. and A.M. Barton. 1992. Patterns and Consequences of Interspecific competition in natural communities. American Naturalist 139(4): 771-801.

Korpimaki, E and C.J.Krebs. 1996. Predation and population cycles of small mammals. BioScience. 46 (10): 754-762.

Murdoch, W.W. 1994. Population regulation in theory and practice. Ecology 75(2): 271-287.

Pimm, S.L., G.J. Russell, J.L. Gittleman and T.M. Brooks. 1995. The Future of Biodiversity. Science 269: 347-350.

Hughes, J.B., G.C. Daily and P.R. Ehrlich. 1997. Population Diversity: Its extent and extinction. Science 278: 689 – 692.

Grassle, J.F. 1991 Deep-Sea Benthic Biodiversity. BioScience 41 (7) 464- 469.

Non-required texts.- these may be helpful, but are not required. Can be used as reference.

Hartl, D. 2000. Primer for population genetics, 3rd Edition. Sinauer, Sunderland, MA

Hastings, A. 1997. Population Biology. Springer.

Hendrick, P.W. 1984. Population Biology. Jones and Bartlett.

Wilson, E.O. and W.H. Bossert. 1971. A primer of population biology. Sinauer.

BIO 423/523 "BIOLOGY OF POLLUTION"

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

Semester: Spring 2003
Time: 3:45 - 5:15 pm; Monday and Friday
Place: 215 Holmes Hall

Office

Hours: J. Haynes. 3:00 - 4:30, Tuesday; 9:30 - 12:00 Thursday; or by appointment
Place: 121 Lennon Hall
Telephone: 395-5783
E-Mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you briefly after class meetings, during scheduled office hours, or by appointment. You should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

Syllabus

Week/Date	Topics	Reading Assignments
1 1/27	Introduction and History	WHSP: xi, xiii-xvi, 3-22; LY: 1-19
1/31	Ecological Foundations	This Guide; WHSP: 23-45; 195-219
2 2/3	Adaptation and Tolerance	WHSP: 220-237; LY: 111-130
2/7	Bioassay Procedures	WHSP: 93-98, 107-118; LY: 21-37
3 2/10	Bioassay Analysis 1: Median Survival Times, Asymptotic LC_{50}'s, Latent Period	LY: 55-92; **Topic/10 References due**
2/14	Bioassay Analysis 2: Chronic Tests, Application Factors, Multiple Toxicants	WHSP: 153-161, 179-192 LY: 37-53, 133-140
4 2/17	Good Laboratory Practices	RR #1
2/21	**EXAM 1**	
5 2/24	Temperature	RR# 2
2/28	Hypoxia	LY: 131-133, 140-151; RR# 5
6 3/3	Acute Gill Effects	WHSP: 46-58; **3 Annotations due**
3/7	Inorganics: Metals, pH, Ammonia	LY: 177-190; RR# 6
7 3/10	Organics 1: Sewage, Eutrophication	RR# 10, 15
3/14	Organics 2: Detergents, Pulp Mills, Oils	RR# 13, 14, 16
8 3/15-23	**SPRING BREAK!**	
9 3/24	Chronic Effects: Physiology	WHSP: 119-139; LY: 93-104
3/28	**EXAM 2**	
10 3/31	Chronic Effects: Behavior and Integration	WHSP: 139-152; RR# 19
4/4	Chronic Effects: Reproduction and Growth	WHSP: 162-178, 248-265
11 4/7	Pesticides and Bioconcentration	LY: 104-111; RR# 20, 21
4/11	Biotransformation and Excretion	WHSP: 58-89; LY: 191-224

12	4/14	Hormonally Active Chemicals	RR# 23, 25
	4/18	Economics and Pollution	LY: 287-314; **20 Annotations due**
13	4/23	**EXAM 3**	
	4/25	Special Topics: Graduate Student Presentations	
14	4/28	Special Topics: Graduate Student Presentations	
	5/2	Pollutant Presentations All Students	
15	5/5	Pollutant Presentations All Students	LY: 225-229
	5/9	Pollutant Presentations All Students	

(Additional Expectations for Graduate Students in ENV 523)

Graduate students are expected to develop and demonstrate a broader and deeper understanding of pollution biology than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in pollution biology.

1. Additional readings, and testing on them, to develop understandings of concepts more broadly and deeply (see study questions).
2. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?
3. Additional project, beyond the annotated bibliography and short presentation required of all students, and presentation. Small teams of graduate students (2-4) will work with me to identify pollution biology topics of interest that are not covered in depth in the course. Each team will prepare a 10 - 15 page paper on the topic and will make a 45 min presentation to the class. Both parts of the project will be graded according to the expectation of the Department of Environmental Science and Biology that its MS graduates are prepared to teach introductory biology at a community college. Alternatively, a team may choose to design, conduct and report on a toxicity test conducted in my laboratory.
4. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students' final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

Texts

Walker, C.H., S.P. Hopkins, R.M. Sibley, and D.B. Peakall. 2001. *Principles of Ecotoxicology* (2nd Ed). Taylor and Francis. London. = **WHSP** above

Landis, W.G., and M.H. Yu. 1999. *Environmental Toxicology: Impacts of Chemicals on Ecological Systems* (2nd Ed.). Lewis Publishers. Boca Raton, FL. = **LY** above

Library Readings

Because my notes and lectures may not always be clear to you, below I list a source (on reserve in Drake Library) from which I have taken information for lectures during weeks 6-10.

Heath, A.G. 1987/1996. *Water Pollution and Fish Physiology*. CRC Press. Boca Raton, FL.

Assigned readings from other references, placed on electronic or paper reserve in Drake Library, are listed below; they should be completed before coming to class. Reserve readings come from a variety of books, journals and other sources. The volume of reading is high in this course, especially for graduate students. Guided by the study questions that follow, you should read these articles to get a sense of the breadth and depth of pollution biology. Reserve readings

(RR) are listed in numerical order as indicated on the syllabus. Ignore non-consecutive numbering. (Items in **bold** below are required for graduate students only.)

RR#1: Garner, W.Y., and M.S. Barge. 1988. Good Laboratory Practices: An Agrochemical Perspective. American Chemical Society. Washington, D.C. Chp. 1 /appended materials.

(RR#2: Brett, J.R. 1979. Environmental factors and growth. Pages 599-675, In: Hoar, W.S., D.J. Randall, and J.R. Brett (Eds.), Fish Physiology, Vol. VIII, Bioenergetics and Growth. Academic Press. Orlando, FL.)

RR#5: Brungs, W.A. 1971. Chronic effects of low dissolved oxygen concentrations on the fathead minnow. J. Fish. Res. Board Can. 28:1119-1123.

(RR#6: (paper) Roesijadi, G., and W.E. Robinson. 1994. Metal regulation in aquatic animals: mechanisms of uptake, accumulation and release. Pages: 387-420, In: Malins, D.C., and G.K. Ostrander (Eds.). Aquatic Toxicology: Molecular, Biochemical and Cellular Perspectives. Lewis Publishers. Boca Raton, FL.)

RR#10: Schindler, D.W., F.A.J. Armstrong, S.K. Holmgren, and G.J. Brunskill. 1971. Eutrophication of Lake 227, Experimental Lakes Area, northwestern Ontario, by addition of phosphate and nitrate. J. Fish. Res. Bd. Canada. 28(11):1763-1782.

RR#13: Munkittrick, K.R. et al. 1992. Response of hepatic MFO activity and plasma sex steroids to secondary treatment of of bleached kraft pulp mill effluent and mill shutdown. Environ. Toxicol. & Chemistry 11:1427-1439.

(RR#14: Kovacs, T.G., and S.R. Megraw. 1996. Laboratory responses of whole organisms exposed to pulp and paper mill effluents: 1991-1994. Pages 459-472, In: Servos, M.R., K.R. Munkittrick, J.H. Carey, and G.J. Van der Kraak (Eds.), Environmental Fate and Effects of Pulp and Paper Mill Effluents. St. Lucie Press. Delray Beach,FL.)

RR#15: (paper) Albers, P.H. 1995. Petroleum and individual polycyclic aromatic hydrocarbons. Pages 330-355, In: Hoffman, D.J., B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr. Handbook of Ecotoxicology. Lewis Publishers. Boca Raton, FL.

RR#16: Jackson et al. 1989. Ecological effects of a major oil spill on Panamanian coastal marine communities. Science 243:37-44.

(RR#19: Weber, D.N., and R.E. Spieler. 1994. Behavioral mechanisms of metal toxicity in fishes. Pages 421-467, In: Malins, D.C., and G.K. Ostrander (Eds.). Aquatic Toxicology: Molecular, Biochemical and Cellular Perspectives. Lewis Publishers. Boca Raton, FL.)

RR#20: (paper) Hill, E.F. 1995. Organophosphorus and carbamate pesticides. Pages 243-274, In: Hoffman, D.J., B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr. Handbook of Ecotoxicology. Lewis Publishers. Boca Raton, FL.

RR#21: (paper) Blus, L.J. 1995. Organochlorine pesticides. Pages 275-300, In: Hoffman, D.J., B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr. Handbook of Ecotoxicology. Lewis Publishers. Boca Raton, FL.

RR#23: (paper) Rice, C.P., and P. O'Keefe. 1995. Sources, pathways and effects of PCBs, dioxins, and dibenzofurans. Pages 424-468, In: Hoffman, D.J., B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr. Handbook of Ecotoxicology. Lewis Publishers. Boca Raton, FL.

RR#25: Johnson, B.L., et al. 1998. Public health implications of persistent toxic substances in the Great Lakes and St. Lawrence basins. J. Great Lakes. Res. 24(2):698-722.

ENV 439/BIO 539 -CONSERVATION BIOLOGY - SPRING 2004

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: M: 10:40 - 11:40; W: 2:30 - 3:30; F: 10:45-1:00 or by Appt.
Phone: 395-5748 (Office); 637-0252 (Home; before 9:00 p.m.)
e-mail: cnorment@brockport.edu

Course Objectives:

1. To describe patterns of biological diversity, and to investigate factors which affect this diversity and vulnerability to extinction.
2. To characterize genetic and demographic characteristics of endangered populations.
3. To discuss design and protection of natural areas.
4. To introduce important research and management methods.
5. To **think** about the implications of ecology and evolution for conservation biology, the implications of conservation biology for society, and the relationship between values, science, and conservation.

Class Meets: 9:30-10:30, MW, 127 Hartwell

Text: Primack, Richard B. 2002. Essentials of Conservation Biology. 3rd edition. Sinauer Associates, Inc., Sunderland, MA. (**required**)
McNamee, Thomas. 1997. The return of the wolf to Yellowstone. Henry Holt and Company, New York, NY. (**required**)

Course Structure: The course format will emphasize lectures, with supplemental discussions, guest presentations, and student projects. .

Grading: Grades will be assigned based upon the following:

Lecture tests - 2 at 100 points each	200
Quizzes - 1	40
Final exam	100
Short papers	100
"Issues" assignment - presentation	120
Homework assignments (approximate pts)	80
Total points	680[1]

(GRADUATE STUDENTS (BIO 539): Graduate students are expected to develop a deeper and broader understanding of conservation biology than is the case for undergraduates enrolled in ENV 439. Requirements for BIO 539 are given on page 2 of the syllabus.)

Attendance: Attendance is required; please come prepared for class. During the term I will take attendance at the start of every class; if you are not present and do not have a valid excuse (doctor's note), 7 points (ca. 1% of the total) will be deducted from your total points for the term. If you do miss a class, it is your responsibility to talk to me about why you missed and what material was missed, and to obtain notes from a classmate. I reserve the right to give unannounced quizzes that cannot be made up.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: = 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Late assignments are penalized 5% per class day (MTWRF). Last day to withdraw from the course with departmental approval is April 30th.

Surviving BIOL 439/539:

1. Come to class and be prepared.

2. If you must miss a class, obtain the notes from another student.
3. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after each class.
6. "Don't worry, be happy."

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to the discussion on pp. 9-12 of *Your Right to Know: Academic Policies Handbook, 2032-2004,* which is published by the Division of Student Affairs. The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence, unless clearly instructed to collaborate. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment**. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(**REQUIREMENTS FOR BIO 539. In addition to the requirements for ENV 439, graduate students in BIO 539 will:**
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete an additional group research project on Habitat Conservation Plans (HCPs). This additional project will require an in-depth analysis of an HCP of the students' choosing. The graduate student group will then make an hour-long oral presentation on HCPs to the class.
3. Complete additional technical readings from the following source:
Conservation Biology: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings. Students will complete a written critical review of one of the papers.)

SCHEDULE - CONSERVATION BIOLOGY, 2004

Date	Topics	Readings[1]
UNIT 1 - Introduction, history, values		
Jan 26	Introduction	3-7
Jan 28	Biodiversity - description/patterns,	Chap 2 (pp. 27-43)
Jan 30	Biodiversity	Chap 3 (pp. 62-82)
Feb 2	History of Conservation - North America	pp. 11-24 **Internet assignment due**
Feb 4	History of Conservation - North America	
Feb 6	Value of Biodiversity	Chap 4; Chap 5 (pp. 111-114, 118-124, 131-134); skim Chap 6
Feb 9	Endangered Species Act	pp. 558-565; papers by Rohlf, O'Connell[2] **Study questions due**
Feb 11	Film: *Varmints*	**Discussion question due** Blaine, PEER, Christian[2]
Feb 13	Discussion - value of biodiversity Return of the wolf	Essays by Hagan, Tippets McNamee, pp. 1-102[3]

Date	Topics	Readings[1]
Unit 2 - Loss of biodiversity: patterns and causes		
Feb 16	**Quiz: Unit 1;** catch-up	

Feb 18	Lecture: Extinctions	Chap 7
Feb 20	Lecture: Extinctions	Chap 7 **Complete question set # 1**
Feb 23	Discussion: Primack, Chapter 7	**Essay # 1 due**
Feb 25	Vulnerability to extinction	Chap 8
Feb 27	Lecture: Habitat fragmentation	Chap 9 (pp. 197-229)
Mar 1	Global change	Chap 9 (pp. 252-260) **Essay # 2 due**
Mar 3	Lecture: Introduced species	Chapter 10 (pp. 276-292)
Mar 5	Discussion: Lomborg	**Complete question set # 2**
Mar 8	Discussion # 3: Synthesis	**Complete question set # 3**
Mar 10	**Test # 1** (Units 1 and 2)	
Mar 12	Habitat Conservation Plans (grad students)	pp. 562-565

Unit 3 - Biology of small populations

Mar 13-21	SPRING BREAK – NO CLASS!!	
Mar 22	Population genetics I	Chap 11 (pp. 297-320)
Mar 24	Population genetics II	
Mar 26	Demographic/environmental variation Discussion: Return of the Wolf (pp 105-210)[3]	Chap 11 (pp. 32-327)
Mar 29	Metapopulations	Chap 12 (pp. 348-351)) **Pop. gen. assign due**
Mar 31	Metapopulations; PVA	Chap 12 (pp. 344-348)
Apr 2	In-class PVA project using RAMAS/metapop (computer lab)	
Apr 5	In-class PVA project, continued	

Unit 4 - Management issues and methods

Apr 7	Design of protected areas	Chapter 16, 15 (pp. 427-444)
Apr 9	Review PVA project	
Apr 12	Managing protected areas	Chap 12 (329-344) Chap 17 (pp. 473-487) Chap 18 (pp. 509-514) Ludwig et al.[2]
Apr 14	Scholar's Day (no class)	
Apr 16	International issues	Asquith[2]
Apr 19	**Test 2 (**Units 3, 4)	
Apr 21	Ex situ strategies/Reintroductions Return of the wolf (McNamee, pp. 211-323)	Chap 13
Apr 23, 26	Group I presentations	
Apr 28, 30	Group II presentations	
May 3, 5	Group III presentations	
May 7	Consensus (Groups I, II, III)	
Final exam:	**Friday, May 14, 8-10 am**	

[1]All readings refer to material in Primack unless otherwise noted.
[2] These papers are on electronic reserve in Drake, where they are listed by title. I list them by author to save space. The authors/titles for those papers listed in the syllabus are given below.
[3] Thomas McNamee, *The Return of the Wolf to Yellowstone*

Electronic reserve readings from syllabus (by date)
Rohlf: Six biological reasons why the Endangered Species Act doesn't work and what to do about it
O'Connell: Response to "Six biological reasons why…."
Blaine: Basic science
Christian: Fraud discovered in endangered species studies
PEER (Public Employees for Environmental Responsibility): Lynx "biofraud" myth

Hagan: Environmentalism and the science of conservation biology
Asquith: Misdirections in conservation biology
Ludwig et al.: Uncertainty, resource exploitation, and conservation: lessons from history

BIO 440/540 - HERPETOLOGY - SPRING 2003

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: M: 10:40 - 11:40; W: 2:30-3:30; F: 10:45-1:00, or by appointment.
Phone: 395-5748 (office)
637-0252 (home; before 9:00 p.m. only; weekends okay)
email: cnorment@brockport.edu

Course Objectives:

1. To develop an appreciation for the diversity of form and function in amphibians and reptiles.
2. To understand the evolutionary history of reptiles and amphibians.
3. To expose students to some basic techniques used in studying amphibians and reptiles in the field.
4. To develop the ability to think critically and ask questions about herps.
5. To investigate conservation issues related to reptiles and amphibians.

Class Meets: MWF 1:15 - 2:15 p.m., 033 Hartwell; F 2:15 - 5:15 p.m., 110 Lennon.

Texts: Pough, F. H., et al. 2001. Herpetology. 2nd edition. Prentice-Hall, Upper Saddle River, NJ. (required)
Conant, R. and J. T. Collins. 1991. A field guide to reptiles and amphibians - eastern and central North America. Houghton Mifflin Company, Boston, MA. (required).
You will also need a 3-ringed field notebook that takes either 6"X9" or 8 1/2"X5 1/2" paper.

Course Structure: The course format will emphasize lecture, field exercises, and laboratory work.

Grading: Grades will be assigned based upon the following scheme (point totals are approximate):

Lecture tests - 2 at 100 points each	200
Quizzes	150
Final exam - 1 at 100 points	100
Lab tests - 1, plus 2 quizzes	150
Field notebook	75
Misc. homework assignments	175
Lab reports	150
Total points	1,000(approximate)

GRADUATE STUDENTS (BIO 540): Graduate students are expected to develop a deeper and broader understanding of herpetology than is the case for undergraduates enrolled in ENV 440. Requirements for BIO 540 are given on page 2 of the syllabus.

Attendance: Attendance is expected; please come prepared for class. During the term I sometimes will take attendance; if you are not present and do not have a valid excuse (doctor's note), 10 points (ca. 1%

of the total) will be deducted from your total points. It is particularly important that all lab sessions be attended, as they may be difficult to make up; an unexcused absence from a lab will result in a deduction of 3% from your grade! If an unannounced quiz is missed, it may not be made up. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes from a classmate.

Grading and Test policy: Lecture and lab tests and the final exam **must** be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to drop the course is February 24. Unless prior arrangements have been made, late work will be discounted at the rate of 5%/ class day (MTWRF).

Surviving BIOL 440/540:

1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3.. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor; *this includes the need for extensions on assignments.*
5. Be aggressive in your approach to studying; for example, review and think about class notes after class.
6. "Don't worry, be happy."

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need which may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to the discussion in "Your Right to Know, 2002-2003" (pp. 9-12), which is published by the Division of Student Affairs. The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment**. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 540. In addition to the requirements for ENV 440, graduate students in BIO 540 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a research term paper on any area of herpetology, subject to approval by the instructor.
3. Complete two additional technical readings from recent volumes of the primary journals in the field. These readings will be discussed with the instructor during two out-of-class meetings. One of the readings will be analyzed in a short review/analysis article.)

SCHEDULE - BIO 440/540 Note: (L) = lab/field day; lectures occur prior to lab/field exercises

Date	Topic	Readings*
Lecture		
Jan 27	Characters and taxa of amphibians	Pp.1-8, Chapter 3 (skim)
Jan 29	Characters and taxa of reptiles	Pp. 8-20, Chapter 4 (skim)
Jan 31(L)	Systematics	Pp 21-25; Fig. 2-1
Feb 3	Evolution - Amphibia	Pp. 25-36
Feb 5	Evolution - Reptilia	Pp. 36-40
	Quiz (basic taxonomy, characters)	
Feb 7(L)	Dinosaur biology (a diversion!)	**Phylogenetics worksheet due**
Feb 10	Homeostasis - temperature regulation	Pp. 171-190
Feb 12	Homeostasis - water	Pp. 159-170, 190-195
		Bibliography due

Feb 14(L)	Homeostasis - finish	
Feb 17	Energetics	Chapter 6 (skim)
Feb 19	Catch-up day	
Feb 21(L)	No lecture; lab only	
Feb 24	**Test # 1** (Lecture material from Jan 27-Feb 19)	
Feb 26	Spacing and movements	Pp. 335-352
Feb 28(L)	Orientation (guest lecture, Dr. Dave Holtzman) **Lab quiz** (see next page)	Pp. 353-364
Mar 3	Feeding/diet	Chapter 9 (skim 292-325)
Mar 5	Venomous/toxic herps	Pp. 325-332
Mar 7(L)	Reproduction I	Chapter 7 (pp. 228-243)
Mar 10	Reproduction II	Chapter 7 (pp. 243-259)
Mar 12	Reproduction III	
Mar 14	No lecture; **lab exam** (see next page)	
Mar 17-21	Spring break(down)	
Mar 24	Mating Systems I	Chapter 12 (pp. 398-413)
Mar 26	Mating Systems II	Chapter 12 (pp. 413-430) **UV lab report due** (tentative)
Mar 28(L)	Mating Systems III	
Mar 31	**Test 2** (Lecture material from Feb 26-Mar 28)	
Apr 2	No class: Scholar's Day	
Apr 4(L)	No lecture: field trip to zoo	
Apr 7	Population biology I	
Apr 9	Population Biology II	**Zoo assignment due**
Apr 11(L)	No lecture; **quiz**, field trip	
Apr 14	Census methods	**Hand in field notebooks**
Apr 16	Foraging ecology/interactions	Chapter 13 **Population biology worksheet due**
Apr 18(L)	No lecture; field trip	
Apr 21	Community ecology I	Chapter 14 **Habitat selection lab due** (tentative)
Apr 23	Community ecology II	
Apr 25(L)	No lecture; field trip to Iroquois NWR	
Apr 28	Biogeography and evolution	
Apr 30	Conservation Biology I	Chapter 15
May 2	No class	
May 5	No class	
May 7	Conservation Biology II	**Iroquois NWR assignment due**
May 9 (L)	Finish up; field work	

Final exam: Wednesday, May 14, 10:30-12:30

*All readings, unless otherwise indicated, are from Pough et al.

Lab Schedule

DATE	TOPIC
Jan 31	Anatomy I (Integument/External Anatomy)
Feb 7	Set up UV lab **Note**: a formal lab writeup will be required; due date depends upon how quickly larval development proceeds
Feb 14	Anatomy II (Skeleton)
Feb 21	Anatomy III (Digestion/Respiration/Circulation)
Feb 28	**Lab quiz** (Anatomy 1 and 2); Habitat selection lab
Mar 7	Anatomy IV (Excretion/Reproduction/Sensory systems); Review
Mar 14	**Lab Test (Labs I - IV)**
Mar 28	Taxonomy: local reptiles and amphibians **UV lab report due**
Apr 4	Field trip - Buffalo Zoo: taxonomy
Apr 11	Field trip; **Quiz –** local taxonomy
Apr 18	Field trip - Ossian State Forest; **late return**
Apr 25	Field trip – Iroquois National Wildlife Refuge

May 2	No class
May 9	Field trip
May 12	**Field notebooks due**.

Note 1: Beginning after spring break, I will be leading evening (± 1.5 hr) field trips about once/week (weather permitting). **Each student must participate in at least one evening outing.**
Note 2: "Taxon" quizzes (n = 8) will be given every Friday, unless otherwise noted.

BIOL 427/527 - ANIMAL BEHAVIOR – FALL 2003

Note: (Instructions for graduate students are indicated in parentheses)

Instructor: Dr. Chris Norment
Office: 119 Lennon
Office hours: T R 2:55-3:55 p.m., F 9:00-11:00 a.m., or by Appt.
Phone: 395-5748 (office)
637-0252 (home; **before 9:00 p.m**.)
E-Mail: cnorment@brockport.edu

General Course Objectives are to:

1. Describe the diversity of animal behavior.
2. Understand the influence of genes, developmental pathways, and anatomy on behavior.
3. Examine patterns of behavior in an *evolutionary* context.
4. Develop the ability to think critically and ask testable questions about behavior.
5. Develop improved scientific writing skills.

Class Meets: T R 1:15-2:45 p.m., 030 Hartwell

Text: Alcock, J. 2001. Animal Behavior, 7th edition. Sinauer, Sunderland, MA. (**Required**)
Heinrich, B. 1991. Ravens in winter. Vintage, New York, NY.
A **large** three-ring binder also will be valuable.

Electronic reserves password: raptor

Course Structure: The course format will include lectures, discussions, and cooperative learning exercises. Although no formal lab time is scheduled, several field and lab exercises will be conducted during the term.

Grading: Grades will be assigned based upon the following scheme:

Lecture tests - 2 at 100 points each	200
Final exam - 1 at 125 points	125
Lab reports	225
Problem sets and other written assignments	155
Unannounced quizzes (possible)	30
Total points	705(approximate)

(GRADUATE STUDENTS (BIO 527): Graduate students are expected to develop a deeper and broader understanding of animal behavior than is the case for undergraduates enrolled in ENV 427. Requirements for BIO 527 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. During the term I will take attendance; if you are not present and do not have a valid excuse (doctor's note, etc.), 7 points (about 1% of your grade) will be deducted from your grade. If you do miss a class, it is your responsibility to talk to me about what material was missed, and to obtain notes f**rom a classmate**. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up. See p. 8 of *Your Right to Know & Academic Policies Handbook* for an explanation of the college's policy on attendance.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 65-79% = C range; 55-65% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to withdraw from the course is December 1. Withdrawal policies are described in *Your Right to Know & Academic Policies Handbook*. **Unless prior arrangements have been made, late work will be discounted at the rate of 5%/school day**. Tests will be based primarily on material discussed during lectures and study group sessions. **However**, approximately 10% of the points on each test may be based on material covered in your text, but not in class.
Surviving BIOL 427/527:

1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3.. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after the lecture.
6. "Don't worry, be happy." (Mehr Babba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need which may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-11, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, "*Your Right to Know & Academic Policies Handbook, 2000-2001*". The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class, or in a previous class. (In order to account for this last, unfortunate possibility, I keep a random subset of major papers from previous classes on file.) A wise policy might be to discuss freely, but write with complete independence. **Failure to adhere to the standard of independent written work may result in a 0 on the assignment or the course**. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 527. In addition to the requirements for ENV 427, graduate students in BIO 527 will:
1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete a research term paper that involves analysis of a current, controversial topic in animal behavior. The paper will require comparison of opposing viewpoints, analysis, and defense of the student's position on the controversy.
3. Complete additional technical readings from the following sources:
Allen, C. and M. Beckoff. 1999. Species of mind: The philosophy and biology of cognitive ethology. MIT
Press, Cambridge, MA.
Cheney, D.L. and R. M. Seyfarth. 1990. How monkeys see the world: Inside the mind of another species.
University of Chicago Press, Chicago IL.
***Animal Behaviour*: Two current papers from the most recent volume of the primary journal in the field.**
These readings will be discussed with the instructor during two out-of-class meetings.)

SCHEDULE

Date	Topic	Readings*

Week 1			
Aug 26	Introduction, Squirrel Assignment I	pp. 1-9	Aug 29
Aug 28	Methods of studying behavior	Clotfelter (e-reserves)	
Week 2			
Sept 2	Lab time (honeybee orientation)	**Lopez essay due**	
Sept 4	Statistics and hypothesis testing Scientific writing	Handouts	
Week 3			
Sept 9	Evolution and Natural Selection	pp. 9-18	
Sept 10	Evolution of behavior: geographical variation	**Squirrel assignment I due**	
Week 4			
Sept 16	Discussion: methods/Lopez essay Development of behavior: genes and environment I	Chapter 3	
Sept 18	Development of behavior: genes and enviroment II	Chapter 4	
Week 5			
Sept 23	Finish development;	**Bee report draft and review due**	
	Neural systems and behavior	Chapter 5 (115-142)	
Sept 25	Continue neural systems Discussion: *Ravens in Winter*, pp. 11-104		
Week 6			
Sept 30	**Test 1** (Aug 26 – Sept 225; includes *Ravens in Winter*, pp. 11-104)		
Oct 2	Guest lecture: Dr. Dave Holtzman, Nasal chemical senses		
Week 7			
Oct 7	Lab: Vomeronasal use in snakes		
Oct 9	Endocrine systems and behavior	Pp. 78-79, Chapter 6	
Week 8			
Oct 14	NO CLASS!		
Oct 16	Discussion of vomeronasal lab/ Foraging behavior	**Final draft of bee report due** Chapter 8	
Week 9			
Oct 21	Film/Foraging behavior		
Oct 23	Male and female tactics I	Chapter 11	
Week 10			
Oct 28	Male and female tactics II	**Optimality model problem set due**	
Oct 30	Mating systems	Chapter 12	
Week 11			
Nov 4	Mating systems, continued Discussion: *RIW*, pp. 105-207	**Mating tactics problems due**	
Nov 6	**Test II** (Covers material from Oct 2 - Nov 4; includes *RIW*, pp. 105-207)		

Week 12

Nov 11	Social systems	Chapter 14 (422-445)
Nov 13	Social systems	Chapter 14 (445-455)

Week 11

Nov 18	Behavior of domestic animals	**Vomeronasal lab due**
Nov 20	Animal intelligence	**Discussion questions due** Cheney & Seyfarth (e-reserves)

Week 14

Nov 25	Animal intelligence/discussion	
Nov 27	No class; give Thanks!	

Week 15

Dec 2	Evolution of human behavior	Chapter 15 **Discussion questions due**
Dec 4	Discussion: human behavior *RIW*, pp. 208-301	

Week 16

Thursday, Dec 9 (10:30-12:30) **Final exam** (Includes *RIW*, pp. 208-301)

*Unless otherwise noted, all readings are from Alcock.

BIO 459/559 - MAMMALOGY - FALL 2003

Note: (Instructions for graduate students are indicated in parentheses)

Instructor: Dr. Chris Norment
Office: Lennon 119
Office hours: T R 2:50-3:50 p.m., F 9:00-11:00 a.m., or by appointment.
Phone: 395-5748 (office)
637-0252 (home; **before 9:00 p.m.**)
E-mail: cnorment@brockport.edu

Course Objectives:

1. To develop an appreciation for the diversity of mammalian form and function, in anatomical, physiological, and ecological contexts.
2. To understand the evolutionary relationships among mammals, and the relationship of mammals to other vertebrates.
3. To expose students to some basic techniques used in studying mammals in the field.
4. To develop the ability to think critically and ask questions about mammals.

Class Meets: T R 9:45-11.15 a.m., 121 Smith, F 1:15-5:00 p.m., 110 Lennon

Texts and Materials:

Vaughn, T., et al. 1999. Mammalogy. 4th edition. Saunders. (**required**)
Martin, R. E., et al. 2001. A Manual of Mammalogy. 3rd edition. McGraw Hill. (**required**).
Burt, W. H. and R. C. Grossenheider. 1976. A Field Guide to the Mammals. 3rd ed. (optional).
A large, 3-ringed binder will also help in organizing course materials.

Electronic reserves password: rhino

Course Structure: The course format will emphasize lecture, field exercises, and laboratory work.

Grading: Grades will be assigned based upon the following scheme:

Lecture tests and quizzes	250
Final exam - 1 at 125 points	125
Lab tests - 2 at ± 75 points each	150
Peromyscus research paper/lab report	100
Annotated Bibliography	50
Problem sets	50
Taxon quizzes (8 @ 15 pts. ea)	120
Total points	845 (approximate)

(GRADUATE STUDENTS (BIO 559): Graduate students are expected to develop a deeper and broader understanding of mammalogy than is the case for undergraduates enrolled in ENV 459. Requirements for BIO 559 are given on page 2 of the syllabus.)

Attendance: Attendance is expected; please come prepared for class. If you do miss a class, it is your responsibility to talk to the instructor about what material was missed, and to obtain notes from a classmate. It is particularly important that all lab sessions be attended, as they may be difficult to make up. If an unannounced quiz is missed, it may not be made up. I will take attendance before each lecture class; if you are absent and do not have a legitimate excuse, your grade will be lowered 9 points (about 1% of the total possible); an unexcused absence from a lab class will result in the loss of 27 points (about 3% of your grade). See p. 8 of "Your Right to Know & Academic Policies Handbook" for an explanation of the college's policy on attendance.

Grading and Test policy: Lecture tests and the final exam must be taken on the scheduled dates and may not be made up unless arranged in advance, or with a doctor's written excuse. The following guidelines will be used to assign grades: 90% = A range; 80-89% = B range; 70-79% = C range; 55-69% = D range; < 55% = E. The grade scale will be established by reference to undergraduates only, so that performance of graduate students will not affect the grades of undergraduates. Last day to withdraw from the course is December 1. **Unless prior arrangements have been made, late work will be discounted**

at the rate of 5%/ school day.

Surviving BIOL 459/559:

1. Come to class and be prepared.
2. If you have to miss a class, obtain the notes from another student.
3.. Seek help when you need it, and ask questions.
4. Anticipate problems beforehand and discuss them with the instructor.
5. Be aggressive in your approach to studying; for example, review and think about class notes after class.
6. "Don't worry, be happy." (Mehr Baba)

Statement on Disability: I would appreciate hearing from anyone in this class who has a special need that may be a result of a disability. I am reasonably sure we can work out whatever arrangement is necessary, be it special seating, testing, or other accommodation. See me after class, or during my office hours, as soon as possible.

Statement on Academic Integrity: I take the need to maintain academic integrity seriously, and refer students to pp. 9-12, "The Policy on Student Academic Dishonesty" in the SUNY Brockport publication, "Your Right to Know & Academic Policies Handbook". The most common problem that I have encountered is the submission of written work clearly related to that of another student in the class. A wise policy might be to discuss freely, but write with complete independence. Failure to adhere to the standard of independent written work may result in a 0 on the assignment, or an E grade in the course. If you are at all unclear as to your responsibilities or the conventions of the discipline, please talk with me.

(REQUIREMENTS FOR BIO 559. In addition to the requirements for ENV 459, graduate students in BIO 559 will:

1. Develop more-in depth knowledge of the subject. Thus, graduate student exams and papers will be graded more rigorously.
2. Complete an additional research project associated with the *Peromyscus leucopus* lab report that all students complete. This additional project will require an in-depth analysis of data in the 11-year database for *Peromyscus* populations in the Brockport woods. The statistical analysis and write-up, with relevant literature, will be presented as an addendum to the regular *Peromyscus leucopus* lab report.
3. Complete additional technical readings from the following source:
Journal of Mammalogy: Two current papers from the most recent volume of the primary journal in the field. These readings will be discussed with the instructor during two out-of-class meetings.)

SCHEDULE - BIO 459/559 - Fall 2003

Date	**Topic**	**Readings***
	Week 1	
Aug 26	Introduction/Characteristics	Chap 2 (pp. 8-27)
Aug 28	Classification/origin of mammals I	Chap 1 (pp. 2-6)
Aug 29	Bats: lecture (1:15-2:15)	pp. 138-149, 404-411
	Field trip: bats (7-10 pm)	
	Week 2	
Sept 2	Classification/Origin of mammals II	Chap 3
	Quiz - mammalian orders	
Sept 4	Distribution of mammals I	476-482
Sept 5 (L)	Mammal trapping (lecture)	
	Set mammal traps	**Phylogeny problems due**
Week 3		
Sept 9	Distribution of mammals II	Chap 25 (esp. pp. 528-540)
	Group problem	
Date	***Topic***	***Readings****
Sept 11	Mammalian communities I - patterns	pp. 483-505
Sept 12 (L)	**Quiz - characteristics, classification, origins**	
	Field work: Woodchuck observations	

Week 4		
Sept 16	Mammalian communities II - processes	**Bring diskette to class**
Sept 18	Catch-up, group problem	
Sept 19(L)	Analysis of *Peromyscus* data	
	Week 5	
Sept 23	Population dynamics I	pp. 506-526
Sept 25	Population dynamics II	***Peromyscus* bibliography due**
Sept 26(L)	Buffalo Zoo field trip	
	Week 6	
Sept 30	Reproduction I	pp. 334-346, 352-363
Oct 2	**Test 1 - material from Aug 26 – Sept 25**	
	Oct 3(L) Rat dissection	
	Group problem (populations)	
	Week 7	
Oct 7	Reproduction II	pp. 346-352
Oct 9	Reproduction III	
Oct 10(L)	Dentition lab Group problem (reproduction)	
Week 8		
Oct 14	No class - Fall Break	
Oct 16	Metabolism and temperature regulation I	pp. 364-378
Oct 17(L)	Skeleton lab	
	Week 9	
Oct 21	Metabolism and temp reg II	pp. 380-388, 394-403 ***Peromyscus* paper due (draft), with peer review)**
Oct 23	Metabolism and temp reg III/ Group problem	
Oct 24(L)	**Lab practical 1**	
Week 10		
Oct 28	Feeding/digestive specializations I	pp. 272-273
Oct 30	Film - Monotremes and marsupials	
Oct 31(L)	Noneutherians, Insectivora/Chiroptera	
	Week 11	
Nov 4	Feeding/digestive specializations II Group problem	pp. 433-436
Nov 6	Catch-up	
Nov 7(L)	Carnivora	
	Week 12	
Nov 11	**Test 2 - from Sept 30 - Nov 6**	
Nov 13	Sexual selection and mating systems	pp. 450-456
Nov 14(L)	Rodents	
	Week 13	
Nov 18	Social systems I	pp. 456-475 ***Peromyscus* lab report due**
Nov 20	Social systems II/Group problem	
Nov 21(L)	Subungulates/Artiodactyla/Perissodactyla	
	Week 14	
Nov 25	Social systems III	
Nov 27&28	No class: Give Thanks!	
Week 15		
Dec 2	Conservation of mammals	Chap 26
Dec 4	Review for lab test	
Dec 5(L)	**Lab practical II**	
Dec 11	**Final exam: 10:30-12:30**	

*Unless otherwise indicated, all readings are from Vaughn et al.; M = Martin et al.

LABS: From September 19th on, bring both Vaughn et al. and Martin et al. to lab!!!

Note: Once we get going there will be a cumulative "taxon quiz" every Friday for eight weeks

ENV 488/588: Environmental Impact Analysis

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one college-level ecology course or some background in general science before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

Semester: Summer 2004, Session I, May 17 - 28
Time: 9:00 am - 5:00 pm; Monday through Friday
Place: 118 Lennon Hall

Office

J. Haynes. Hours: During regular class time
Place: 121 Lennon Hall
Telephone: 716-395-5783
E-Mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you during class meetings. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course.

Text

Bregman, J.I. 1999. *Environmental Impact Statements* (2nd ed.). Lewis Publishers. Boca Raton, FL.

Syllabus

Mon, May 17

am: Introductions: Course, Participants, Environmental Analysis/NEPA
pm: Tour Project Area; Preliminary Scoping
Assignment: SEQRA/Permit Materials; Bregman--Chapters. 1, 2

Tue, May 18

am: EIA/EIS Procedures
pm: Organize and Work on Team Special Projects
Assignment: SEQRA/Permit Materials; Bregman--Chapter 3

Wed, May 19

am: Teams Identify and Summarize Laws and Regulations Relevant to the Project
pm: Regulatory Perspective: SEQRA, Permits, Scoping the Class Project
(Mr. Albert Butkas, NYSDEC, retired)
Assignment: This Guide, p. 1-15; Bregman--Chapter 6

Thu, May 20

am: Assessing Environmental Impacts
pm: Work on Team Special Projects
Assignment: Bregman--Chapter 7

Fri, May 21

am: EIA/EIS Methodologies; Teams Prepare Environmental Impact Assessment (EIA)
pm: Teams Complete EIA; Make Positive or Negative Declaration; **Quiz #1**

Mon, May 24

am: Complete Team Special Projects
pm: Teams Organize and Tabulate Information for EIS; Develop EIS Outline

Tue, May 25

am: Citizen Participation in EIA; Present Special Projects to Class

pm: Teams Begin Drafting EISs

Assignment: Bregman--Chapter 4

*Wed, May 2*6

am/pm: Teams Continue Drafting EISs

Thu, May27

am: **Quiz #2**; Graduate Student Presentations

pm: Permit Hearing Preparation; Continue Drafting EISs

Fri, May 28

am: Complete and Turn In Team EISs

pm: Permit Hearing (Mr. Albert Butkas, NYSDEC);

(Additional Expectations for Graduate Students in ENV 588)

Graduate students are expected to develop and demonstrate a deeper understanding of environmental impact analysis than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in environmental impact analysis.

5. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?
6. Additional project, beyond the assignments required of all students, and presentation. Small teams of graduate students (2-4) will review an existing EIS, then prepare a 10 - 15 page critique of the EIS. Writing style and mechanics will be graded according to the expectation of the Department of Environmental Science and Biology for MS thesis-quality writing.
7. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students' final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

Semester: Spring 2004
Time: 3:45 - 5:15 pm; Monday and Friday
Place: 218 Lennon Hall

Office

Hours: J. Haynes, 2:30 - 3:30, MF; 9:30 - 12:00, W; or by appointment
Place: 121 Lennon Hall
Telephone: 395-5783
E-mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance briefly after class meetings, during scheduled office hours, or by appointment. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

Texts to Purchase

Diana, J.S. 2004. *Biology and Ecology of Fishes* (2nd ed.) Cooper Publishing Group. Traverse City, MI.

Kohler, C.C., and W.A. Hubert (eds.). 2002. *Inland Fisheries Management in North America* (2nd ed.). American Fisheries Society. Bethesda, MD.

Library Reserve Texts

Bond, C.E. 1996. Biology of Fishes (2nd ed.). Saunders College Publishing. Orlando, FL.

Jobling, M. 1995. Environmental Biology of Fishes. Chapman and Hall. London.

Reading assignments for each class meeting are listed in the Syllabus below and should be completed before coming to class. The reading can be heavy going at times, but your text and library readings provide valuable reinforcement and complementary material for topics covered in lecture. The abbreviations for assigned readings, shown on the syllabus below, are coded as follows: B = Bond, D = Diana, J = Jobling, and KH = Kohler and Hubert.

Syllabus

Week/Date	Topics	Readings
1 1/26	Introduction/Basics	D:xiii-iv, 1-11; B:3-16; this Guide
1/30	Movement	J:251-273, 286-295; D:294-311
2 2/2	Feeding/Nutrition	D:12-57
2/6	Gills: Ventilation/Excretion	J:114-136, 211-249
3 2/9	Gas Bladder: Buoyancy	J:273-286
2/13	Senses	J:11-45
4 2/16	Senses/Reproduction	D:313-321, 331-344; **Topic/References Due**
2/20	Reproduction/Development	D:345-365
5 2/23	**Exam 1**	

	2/27	Life History	D:321-330, 270-293
6	3/1	Behavior	D: 201-223, 224-243
	3/5	Adaptations/Relationships	D:175-200, 244-269
7	3/8	Trout Ecology	D:399-413; KH:481-504
	3/12	Environ./Pop. Interactions	D:134-146
		Spring Break!	
8	3/22	Recruitment	D:147-174; J:391-403
	3/26	Recruitment/Growth	D:59-80; **Paper Outline Due**
9	3/31	Growth	D:81-108; KH:151-155
	4/2	**Exam 2**	
10	4/5	Mortality	KH:140-150
	4/9	Models 1	KH:127-140
11	4/12	Models 2	KH:155-163
	4/16	Management 1	KH:3-30
12	4/19	Management 2	KH:31-59, 455-457
	4/23	Management 3	KH:403-430, 249-284; **Paper Draft to Peer**
13	4/26	Graduate Student Presentations	**Reviewer**
	4/30	**Exam 3**	
14	5/3	Great Lakes Fisheries	KH:623-664; D:377-398; **Paper Due**
(	5/7	Biodiversity	KH:431-454; D:477-490)

(Additional Expectations for Graduate Students in ENV 584)

Graduate students are expected to develop and demonstrate a deeper understanding of fish ecology than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in fish ecology.

a. Additional readings, and testing on them, to develop understandings of concepts more deeply and mathematically (see study questions).

b. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?

c. Additional project, beyond the fish life history paper required of all students, and presentation. Small teams of graduate students (2-4) will work with me to identify fish ecology topics of interest that are not covered in depth in the course. Each team will prepare a 10 - 15 page paper on the topic and will make a 45 min presentation to the class. Both parts of the project will be graded according to the expectation of the Department of Environmental Science and Biology that its MS graduates are prepared to teach introductory biology at a community college.

d. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students' final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

ENV 490/590 "FISHERY TECHNIQUES

Note: (Instructions for graduate students are indicated in parentheses)

Prerequisites

It is assumed that you have had at least one ecology course and one general biology course at the college-level before attempting this course. Otherwise, you must have permission from me to remain in the course.

Course Information

Meetings

IDENTIFICATION"
Semester: Fall 2003
Time: 12:00 - 5:00 pm; Tuesday
Place: 118 Lennon Hall

Office

J. Haynes. Hours: 2:30 - 3:30 pm, MW; 9:30 - 11:00 am TW; or by appointment
Place: 121 Lennon Hall
Telephone: 585-395-5783
E-mail: jhaynes@brockport.edu

I will be happy to discuss any aspect of the course or your performance with you during class meetings and scheduled office hours, or by appointment. In particular, you should come to me as soon as you perceive that you may be having difficulty with any aspect of the course. Please bring your notebook and any other relevant course materials to our meetings.

Texts

Murphy, B.R., and D.W. Willis (Eds.). 1996. Fisheries Techniques (2nd Ed.). American Fisheries Society. Bethesda, MD. (abbreviated 'MW' in syllabus)

Smith, C.L. 1985. The Inland Fishes of New York State. New York Department of Environmental Conservation. Albany, NY. (abbreviated 'S' in syllabus)

Reading assignments for each week's meeting are listed in the syllabus below and should be completed before coming to class. There are no formal lectures in this course, but you are responsible for mastering material in your texts and other handouts. Study questions at the end of this Course Guide will guide your reading. ***Be sure to bring Smith's fish key to each of the fish identification lab periods listed on the syllabus and to Exam 2***.

Syllabus

Week/Date	Topics	Readings
1 8/26	Introduction/References (R)	This Guide: 1-17; MW:1-15, 63-81
2 9/2	Backpack Electrofish/Seines	MW:221-253, 121-155
3 9/9	Gill/Trawl Nets/Pop Estimate (R)	MW:157-192, 433-446
4 9/16	Trap Nets/Boat Electrofish	MW:193-220, 303-333
5 9/23	Community Spreadsheets (R)	MW:353-383
6 9/30	**Exam 1**/Fish Identification 1	S:1-24 (plus pages in this Guide)
7 10/4	Fish Identification 2	MW:255-302, 555-590
8 10/14	No Class: Mid-semester Break	
9 10/21	Fish Identification 3	MW:385-432, 533-554
10 10/28	Fish Anatomy (R)	Lagler Chp.3 (pages in this Guide)
11 11/4	**Exam 2**/Food Habits (R)	MW:513-532

12 11/11	Aging and Growth (R)	MW:483-512
13 11/18	Length/Weight/Fecundity (R)	MW:447-482
14 11/25	Bioenergetics Modeling (R)	Hewett and Johnson (pages in this Guide)
15 12/2	**Exam 3**/Technique Presentations	

(R) Report due at the beginning of class the following week

(Additional Expectations for Graduate Students in ENV 590)

Graduate students are expected to develop and demonstrate a deeper understanding of fishery techniques and fish identification than undergraduates. Several assignment, evaluation and assessment techniques are used to determine whether or not graduate students demonstrate a higher level of competence in fishery techniques and fish identification.

8. Additional readings, and testing on them, to develop understandings of concepts more deeply and mathematically (see study questions).
9. More rigorous evaluation of performance on examinations. Do graduate students exhibit a thorough understanding (breadth and depth) of the material required to answer questions fully? Do they competently answer more complex questions, not given to undergraduates, about theory and mechanism?
10. Additional projects beyond the oral presentation on a fishery technique required of all students. Each graduate student will also write a 6 – 8 page paper on the fishery technique that he or she chooses to speak about. The paper will be graded according to the expectation of the Department of Environmental Science and Biology for MS thesis-quality writing, and the presentation will be graded according to standards for presentation at a professional society meeting. Collectively, the graduate students will work together to improve the fish museum at SUNY Brockport by collecting fish in the field and properly identifying, preserving and cataloging specimens.
11. More rigorous assignment of a final grade. For the purpose of assigning final grades, graduate students' final course averages are compared only to other graduate students. To earn a grade equal to that of an undergraduate, a graduate student must have a final average about 2% higher (e.g., 90% is an A- for an undergraduate and a B+ for a graduate student; see below).

Laboratories

We will begin each 5 h class period with a brief introduction to the day's activities at **12:00 sharp**, then leave for field work or begin lab exercises. There are no formal lectures, but you must be familiar with information from assigned readings and the laboratory exercises to successfully complete this course. Our emphasis is hands-on experience with fishery techniques and fish identification. Following a few general guidelines will make laboratory/field sessions and lab report writing more enjoyable and beneficial for you and other students.

Plant Ecology ENV 495/595 Spring 2003
Prerequisite -Ecology, ENV 303
(Graduate Requirements are in parentheses and are highlighted)
Class meets: Monday, Wednesday, and Friday, 12:00 – 1:00 PM,
Lab meets:

Instructor: Geoffrey Gardner, Ph.D.
Office: Lennon 117
Phone: 395-5743
Email: ggardner@brockport.edu
Office Hours: Tues+Thurs 11:30-12:30; Wed 1:30-2:30

Required text: Gurevitch, Scheiner, Fox: *The Ecology of Plants.* 2002 edition
Supplemental readings: any supplemental readings necessary will be available on reserve.

Grading: 100 total points
Two exams (2 best scores from 3 exams given, including the final): 30 pts each
Topic Paper: 20 pts
Lab: 15 pts
Participation: 5 pts

Tentative schedule

Day	Date	Topic	Reading	Lab
M	1/27	Course Introduction		No Lab
W	1/29	Consequences of being a Plant	Ch 1	
F	1/31	Photosynthesis + Light	Ch 2	
M	2/3	Photosynthesis + Gas exchange	Ch 2	Competition Lab I
W	2/5	Photosynthesis	Ch 2	
F	2/7	Water Relations	Ch 3	
M	2/10	Water Relations	Ch 3	Competition Lab II
W	2/12	Life Below Ground: Soil	Ch 4	
F	2/14	Soil	Ch 4	
M	2/17	Ecological effects of Global change	Ch 22	Winter Botany
W	2/19	Evolution – Processes	Ch 5	
F	2/21	Evolution – Outcomes	Ch 6	
M	2/24	Discussion		Photosynthesis Lab
W	2/26	Exam #1		
F	2/28	Plant population dynamics	Ch 7	
M	3/3	Plant population dynamics	Ch 7	Dendrochronology
W	3/5	Plant reproduction – dispersal	Ch 8	
F	3/7	Plant reproduction – pollination	Ch 8	
M	3/10	Plant Life history	Ch 9	

W	3/12	Plant Life history	Ch 9	tree age distributions
F	3/14	Interspecific Competition	Ch 10	
	3/17-3/21	No Class (Spring Break)		No Lab
M	3/24	Intraspecific Competition	Ch 10	BBD
W	3/26	Parasitism – Herbivory	Ch 11	
F	3/28	Parasitism – Disease ecology	Ch 11	
M	3/31	Community properties	Ch 12	Disturbance Ecology
W	4/2	No Class (Scholars Day)		
F	4/4	Fire and other disturbances	Ch 13	
M	4/7	Succession and Plant communities	Ch 13	
W	4/9	Discussion		
F	4/11	Exam #2		
M	4/14	Plant Species Diversity	Ch 12	Succession I
W	4/16	Plant Species Diversity	Ch 14	
F	4/18	Rarity/ conservation	Ch 14	
M	4/21	Biological Invasions	Ch 14	Succession II
W	4/23	Biological Invasions	Ch 14	
F	4/25	Landscape Ecology	Ch 17	
M	4/28	Landscape Ecology	Ch 17	Wetland invasives
W	4/30	Paleoecology	Ch 21	
F	5/2	Paleoecology	Ch 21	
M	5/5	Conservation and Restoration		No Lab
W	5/7	TBA		
F	5/9	Discussion		

Examinations and Assignments

(Graduate Students (ENV 595): Graduate students will be expected to have a broader and deeper understanding of Plant Ecology. Therefore, the expectation level for graduate students is significantly higher than for undergraduates. Graduate students will be expected to complete an extensive research paper and are subject to a more rigorous grading of labs and exams. In addition, graduate students will be responsible for leading class discussion on current topics in plant ecology.)

1. Exams (60 pts.)
The two midterm exams and the final will be the same length and carry equal weight. Each will cover 1/3 of the course material. All three will have the following format:

- half the exam will consist of short answers and definitions; half will consist of extended essay questions, which will be distributed before the exam.
- one week in advance of each exam, you will be give a list of 4-5 essay questions taken from material covered in lecture and lab in the previous 1/3 of the course.
- from this list, 2 questions will be chosen for the exam, exactly as written.
- you are encouraged to discuss these questions with classmates, and draw from your text and any available literature. Your instructor may be consulted for clarification only.
- preparing for the two essay questions will also help you prepare for the rest of the exam.

- during each exam, you will be on your own, with no notes allowed.

Your two best scores from the three exams will be counted. Make-up exams will not be given. If you miss either of the first two exams, you must take the third.

2. Topic Paper (20 pts.)
This will be a term paper reviewing research on one particular topic of plant ecology, using reference material and primary literature. Choose a topic early in the semester. The topic is your choice, and this is a solo project. A topic must be submitted by the scheduled deadline, followed by an outline. The format will be as follows:

- 5-10 pages, double-spaced, including references. (Graduate students papers should be 10-15 pages).
- pages must be numbered
- use subheadings to organize your writing
- state the underlying scientific question clearly, and describe how it arose.
- describe research methods used to probe the question, and their results.
- draw your own conclusions, and suggest further research.
- use the Latin binomial to introduce a species. Common names can be used thereafter.
- minimum of 10 references, mostly primary scientific papers.
- cite last names of authors and dates in parentheses; don't use numbers or footnotes.
- for the bibliography, list references in same format as in your textbook.
- do not use direct quotations; use your own words
- emphasize content over appearance (fancy binders get you NO extra credit. In fact, they make a paper hard to read. We will not be pleased.
- grammar and spelling will be checked.

3. Participation (5 pts.)
You are expected to attend every class and participate in all Tuesday laboratories. Periodically we will have class discussions on various papers/topics/issues.
(Graduate students will be assigned to a date to lead a discussion on a current issue in plant ecology. Graduate students will select the paper for the topic, which will be assigned to the class. A written review of the paper is also expected).

4. Lab (15 pts)
Lab assignments will account for 15 pts of your grade.

GEL462 - GROUNDWATER

Department of the Earth Sciences
SUNY College at Brockport

Instructor: Dr. Mark R. Noll
Office: 327 Lennon Hall
Phone: 395-5717
e-mail: mnoll@weather.brockport.edu
Office Hours:

Semester:
Class Time:
3 hours lecture
3 hours lab

Text: Applied Hydrogeology, 4th Edition (Fetter, 2000)

Course Description:

This course will investigate the fundamental aspects of the hydrologic cycle with emphasis on the subsurface. Relationships between the physics of fluid flow and the physical properties of rocks, sediments, and soils will provide a basis for examination of the management and environmental aspects of groundwater hydrogeology.

Rationale:

Water is essential to life on Earth, and approximately 50% of our water resources come from subsurface sources. As man imposes more pressures on this resource in terms of beneficial uses and past detrimental impacts, groundwater hydrogeology has increased in significance for earth science professionals. This course will look to answer some basic questions that are needed to solve current and future problems:

- What is an aquifer
- What are its geologic and hydrologic properties
- Where does the water come from, which way does it flow and where does it go
- What if the hydraulic gradient
- What is the quality of the water, is it contaminated

Learning Outcomes:

Lecture

1. Define the major components of the hydrologic cycle
2. Identify the principle components of subsurface hydrogeologic systems
3. Formulate models that describe the hydrogeologic system under study
4. Solve common mathematical expressions and equations that elucidate the physical and hydraulic properties of groundwater systems
5. Quantitatively analyze hydraulic data to evaluate groundwater systems in terms of resource management, quality and quantity
6. Evaluate the impact of anthropogenic activities on natural systems

Laboratory

1. Acquire skills in the basic field and laboratory procedures applied to investigating groundwater systems
2. Design experiments that test a specific property
3. Operate laboratory and field equipment so as to produce accurate and precise data
4. Interpret hydraulic data in the context of the system under study
5. Evaluate the quality of experimental data in both a qualitative and quantitative manner
6. Prepare written reports that detail experimental procedures, results, and interpretations

Assessment:

Formal assessment in this course will evaluate the following:

- The basic knowledge and facts of hydrogeology
- Comprehension, use and quantitative solutions to common hydrogeologic expressions and equations
- Application of hydrogeologic principles to solving new problems

- Analysis of groundwater systems
- Synthesis of hydrogeologic principles into a model or hypothesis of a natural groundwater system, and how it works
- Qualitative and quantitative evaluation of the quality and relevance of hydrogeologic data and literature

Formal assessment will be quantified using the following grading scheme:

Tests (3) @ 100 pts each		300 pts
Final Exam		100 pts
Homework		100 pts
Laboratory project reports (2)		100 pts
Term Paper		100 pts
Projects		100 pts
	Total	800 pts

Tests will be given three times during the semester as outlined on the course schedule. You will be given 1 hour to complete each test. Each test will consist of short answer questions and quantitative problem solving exercises. Tests serve as a measure of what you have learned to date, and as a means of identifying subject matter that you need to review again.

The **Final Exam** is cumulative and will cover all material covered over the course of the semester. Everyone must take the final exam. The exam will focus on your ability to connect various aspects of the course in answering more comprehensive questions, by synthesizing information from various sources.

Homework problems will be distributed approximately weekly over the course of the semester. Completed problems are due at the beginning of class on the day assigned when the homework is distributed in class. Late homework will be penalized according to the late assignments policy below with the exception of an excused absence. Questions on these assignments will be similar to the questions on tests.

Laboratory reports will be required for both laboratory projects. These reports should follow the standard format for laboratory reports. If you are not familiar with the proper format, please see me. As these projects are multi-week efforts and involve collaboration with others in the class, interim data summaries will be assigned to ensure that you are on the right track and that everyone has a complete data set. Final reports will be due on the date assigned for each project. Late laboratory reports will be penalized according to the late assignments policy below with the exception of an excused absence.

A **Term Paper** is required. The term paper may be either a survey of the literature on a specific topic or you have the option of designing and completing a field and/or laboratory investigation and writing a formal laboratory report. The general topic for a literature survey paper is groundwater remediation technologies. The term paper is due at the beginning of class on Monday April 28th. Late papers will be penalized according to the late assignments policy below with the exception of an excused absence.

Short **Projects** will be assigned throughout the semester. These will typically involve some independent or group review of literature or data to answer a specific question or solve a

problem. For group assignments, a single group product may be submitted. Late projects will be penalized according to the late assignments policy below with the exception of an excused absence.

Late assignments will be penalized at the rate of 10% of the total number of points per day, weekends and holidays included.

Extra credit will not be offered in this course. The reasoning for this policy it that the assessment plan has been developed as an integrated part of the learning outcomes for the course. Extra credit opportunities may or may not meet the designed learning outcomes. Furthermore, it is inherently unfair to allow some individuals extra credit opportunities and not others.

GEL562 - GROUNDWATER

Additional Requirements

In addition to the requirements stated above for GEL 462, students taking GEL 562 will be required to complete the following work.

2nd Term Paper	100 pts
Critical Reviews	100 pts
Total Points	1000 pts

A **second term paper** will be required for students taking GEL 562 in the area of contaminant hydrogeology. The term paper will consist of a review of the current literature on a specific technology used for groundwater remediation. The paper must focus on a current state-of-the-art technology, in what applications is the technology used, how the technology is applied, the limitations of the technology and the critical groundwater parameters used in system design.

A selection of journal articles will be available for your reading. These articles will be integrated with topics covered in lecture. Over the course of the semester, you must complete a **critical review** on 3 of these articles. Please note, in addition to the critical reviews, a targeted test questions will be included on your version of each test.

GEL/CHM 457 - GEOCHEMISTRY
Department of the Earth Sciences
SUNY College at Brockport

Instructor: Dr. Mark R. Noll
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Office Hours:

Semester:
Class Times:
3 hours lecture
3 hours lab

Text: Environmental Geochemistry, Eby (2004)

Course Description:
This course will apply basic chemical principles such as thermodynamics, kinetics, and equilibrium to the investigation of common low-temperature and environmental geochemical problems.

Rationale:

The Earth is a complex structure of interrelated systems through and within which energy and matter are transferred. An understanding of the chemical reactions that take place in these natural systems is fundamental to developing models of how these systems work and relate to other systems.

Learning Outcomes:

Lecture
7. Identify the physical and chemical characteristic of a system
8. Formulate models that describe the geochemical system under study
9. Observe and identify the signs of and products of geochemical reactions within a system
10. Solve common expressions and equations describing geochemical systems
11. Interpret the significance of geochemical reactions in the context of describing the systems workings
12. Evaluate the impact of anthropogenic activities on natural systems

Laboratory
7. Acquire skills in the basic laboratory and analytical procedures applied to investigating geochemical phenomena
8. Design experiments that test a specific hypothesis
9. Operate laboratory equipment so as to produce accurate and precise data
10. Interpret geochemical data in the context of the system under study
11. Evaluate the quality of experimental data in both a qualitative and quantitative manner
12. Prepare written reports and presentations that detail experimental procedures, results, and interpretations

Assessment:

Formal assessment in this course will evaluate the following:

- The basic knowledge and facts of low temperature and environmental geochemistry
- Comprehension and solution of common geochemical expressions and equations
- Application of geochemical principles to solving new problems
- Analysis of geochemical systems as a complex blend of interdependent reactions
- Synthesis of geochemical principles into a model or hypothesis of a natural geochemical system
- Qualitative and quantitative evaluation of the quality and relevance of geochemical data and literature

Formal assessment will be quantified using the following grading scheme:

Tests (3) @ 100 pts each		300 pts
Homework projects		100 pts
Term paper		50 pts
Laboratory reports		50 pts
Laboratory project		100 pts
	Total	600 pts

Laboratory reports will be required for all laboratory experiments. These reports should follow the format in the attached document on laboratory reports. Reports will be due at the beginning of the next lab period unless otherwise noted. Late laboratory reports will be penalized according to the late assignments policy below with the exception of an excused absence.

A **laboratory project** will be required from each student. This project will consist of a study proposal and experimental design, field and/or laboratory data collection and analysis, and a formal project report. The written project report (80% of grade) will be due the last day of lab, an oral presentation (20% of grade) of your results using Powerpoint will be due during the final exam time slot. A goal of this portion of the course is to complete a project that would be acceptable for presentation at a professional conference, and you will be encouraged to do such. Details on the project will be discussed during the first laboratory session. Late laboratory project written reports will be penalized according to the late assignments policy below with the exception of an excused absence. Late oral presentations will not be accepted with the exception of an excused absence.

Tests will be given three times during the semester as outlined on the course schedule. You will be given **1 hour** to complete each test. Each test will consist of short answer questions and quantitative problem solving exercises. Tests serve as a measure of what you have learned to date, and as a means of identifying subject matter that you need to review again. As the material all interrelated, and the structure of the course will require you to use skills developed early in the course at later dates, all tests are cumulative in nature.

Homework projects will be assigned approximately weekly during the semester. These will consist of quantitative problems, critical reading of journal articles, or short research reports. Assignments will typically be due on Fridays. Late assignments will be penalized according to the late assignments policy below with the exception of an excused absence.

A **term paper** will be required. The paper will cover the geochemistry of a single element of your choice with approval. The element selected and an annotated bibliography are due Feb 13th. A draft report is due March 5th with the final paper due March 26th. In addition to the written paper (90% of grade), a brief 5-10 minute oral report using Powerpoint is required. The oral presentations will be given on April 2nd, but the Powerpoint file must be submitted by April 1st.

Late assignments will be penalized at the rate of 10% of the original total number of points per day, weekends and holidays included.

Lab Safety Policy – Lab safety is an important aspect of this course. The lab safety guidelines, including housekeeping requirements are included. It is your responsibility to be aware of safety requirements, to properly clean any materials you use, and to help maintain equipment in good operating condition. Failure to do so will result in the following penalties.
1st offense – warning
2nd offense – 10% reduction in grade for that lab assignment
3rd offense – 10% reduction in course grade
Their will be an additional 20% reduction in course grade for each offense after the third.

Extra credit will not be offered in this course. The reasoning for this policy it that the assessment plan has been developed as an integrated part of the learning outcomes for the course. Extra credit opportunities may or may not meet the designed learning outcomes. Furthermore, it is inherently unfair to allow some individuals extra credit opportunities and not others.

GEL/CHM 557 – GEOCHEMISTRY

Additional Requirements

In addition to the requirements stated above for GEL/CHM 457, students taking GEL/CHM 557 will be required to complete the following work.

Research Proposal	100 pts
Journal Manuscript Review	100 pts
Total Points	800 pts

You will be required to develop a **research proposal** for a mutually agreed upon topic. The topic must focus on some aspect of geochemistry. It may be related to your thesis work, but not identical to it. The proposal will be prepared following the NSF guidelines for a standard research proposal. Your grade will be based on the quality of writing (20%), the depth of background research (30%), and the quality of your experimental design (50%). Proposal guidelines may be found at www.nsf.gov.

You will be asked to complete two **manuscript reviews** that might be submitted to a journal for consideration for publication. The manuscripts will be supplied to you with guidelines to reviews as used by the Journal of Environmental Quality. You review should cover the following items, 1) scientific merit, 2) quality of results, 3) quality of writing, and 4) adherence to journal guidelines. Your review will address these items and your grade will be based on the overall quality of your review.

Course Outline

Week 1

Introduction to the course. The Earth as a geochemical system.
Reading assignment – Eby, CH 1

Week 2

Review of thermodynamics, kinetics and equilibrium.
Reading assignment – Eby, CH 2

Week 3

Acid-base reactions and the carbonate system
Reading assignment – Eby, CH 3

Week 4

Oxidation and reduction reactions. Fe and S geochemistry
Reading assignment – Eby, CH 4

Week 5

Test #1, Monday 2/23
Stable and radiogenic isotopes.
Reading assignment – Eby, CH 6

Week 6

Clay mineralogy. Reactions at mineral surfaces.
Reading assignment - Eby, CH 7

Week 7

Atmospheric chemistry. Rain water chemistry. Global climate change.
Reading assignment - Eby, CH 8

Week 8

Marine chemistry. Seawater chemistry. Geochemical reactions in sediments
Reading assignment - Eby, CH 10

Week 9

Test #2, Monday 3/29
Continental environments 1. Weathering and soils development. Reading assignment - Eby, CH 9

Week 10

Continental environments 2. Surface and groundwater chemistry

Reading assignment - Eby, CH 9

Week 11

Continental environments 3. Trace metals in terrestrial systems.
Reading assignment - Eby, CH 9

Week 12

Carbon chemistry and cycles.
Reading assignment - Eby, CH 5

Week 13

Elemental Cycling.
Reading assignment - Handouts

Week 14

Test #3, Thursday, 5/6
Elemental Cycling.
Reading assignment - Handouts